SCIENTIFIC AMERICAN

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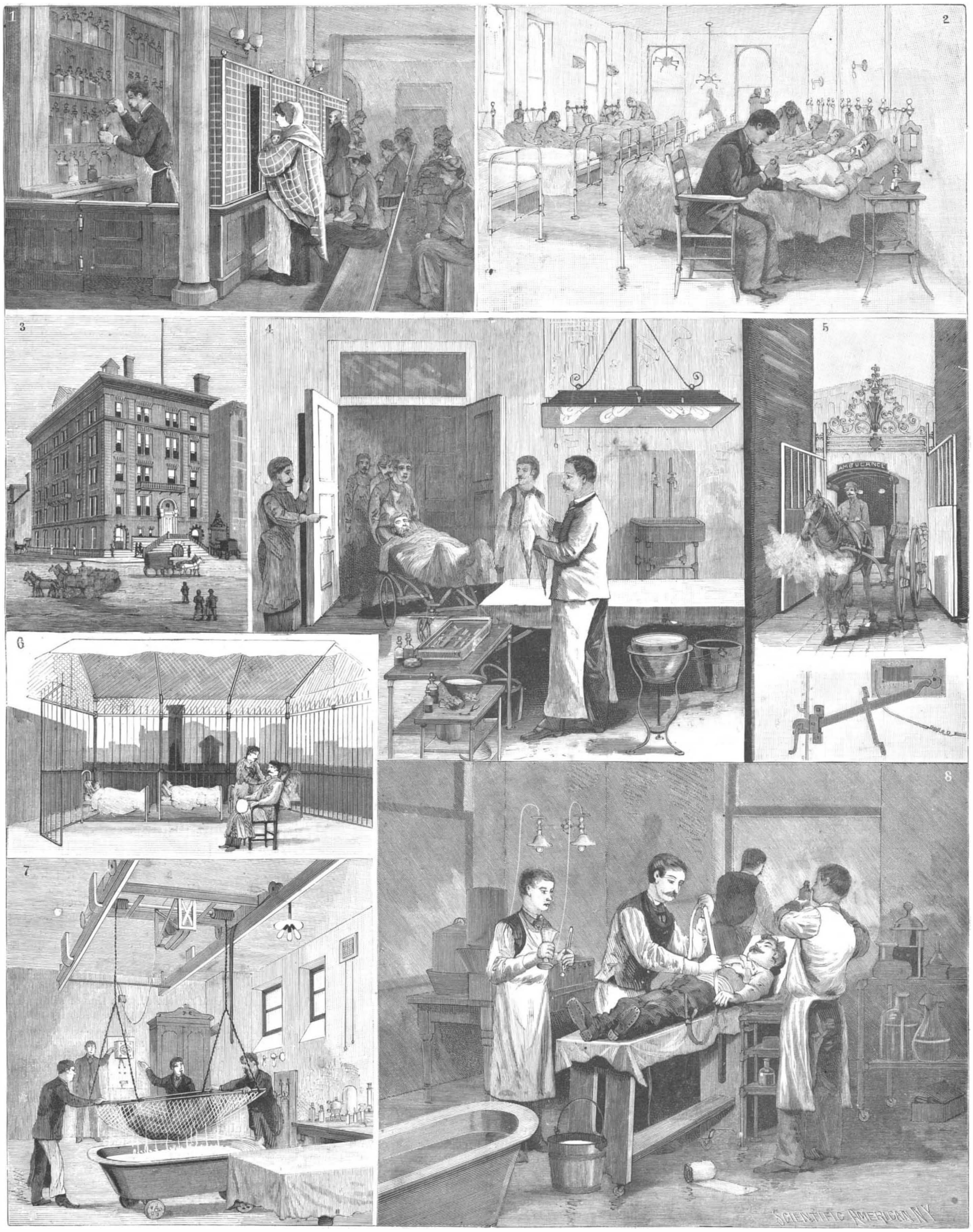

1. The dispensary. 2. Reception ward. 3. Exterior view. 4. Surgical room. 5. Ambulance entrance. 6. Roof garden. 7. Sunstroke ward. 8. Reception operating room.

THE HOUSE OF RELIEF OF THE NEW YORK CITY HOSPITAL.—[See page 391.]

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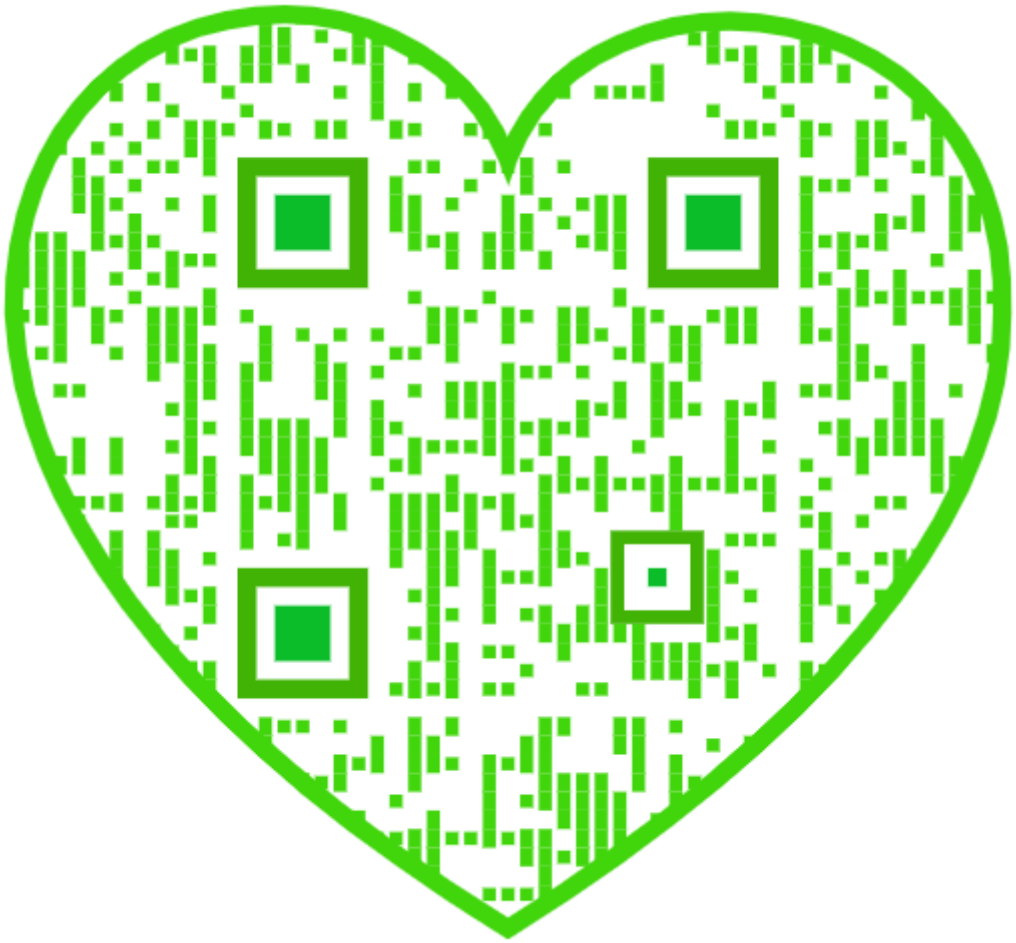

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PROF. S. P. LANGLEY'S FLYING MACHINE.

Experiments with Prof. Langley's flying machine have been in progress for some time past, a long series of private trials having been conducted at Quantico, near Washington, D. C. An aluminum body contains the steam boiler and engine by which the machine is driven. The motive power is a pair of screws or propeller wheels at the rear of the body. These are rotated at very high speed and exert the entire propelling power. There are four aeroplanes, with a maximum width of eight feet. The entire spread is comprised within an area of eight by twelve feet. To direct its course to right or left there is a vertical rudder, and the setting of the wings determines its changes of elevation or of angle of ascent and descent.

It is unnecessary to say that everything about it is constructed to secure the utmost perfection of operation and lightness. Many trials have been conducted, and, at last, the possibility of flight has been proved. A trial of the machine was made on December 13, and the aeroplane successfully accomplished a flight of three hundred yards. This was not the first flight.

This, in connection with Maxim's work, goes far to indicate the possibility that we may yet see a successful aeroplane flying machine. We hope soon to have particulars of the further trial trips.

THE HUDSON RIVER BRIDGE.

The insular situation of New York is one which is destined in the course of time to make it a city of bridges. The East River between New York and Brooklyn has been spanned, and already work is in progress on a second bridge. But the great Hudson River is intact. An unfinished tunnel running part way under its bed marks the only actual attempt to break down its barrier. Over its surface a vast population is transported every day by ferryboats. The mouth of the Hudson is at New York City, and a most curious fact is that for many miles of the final portion of its course the narrowest part of the river is at the city, Castle Point, Hoboken, N. J., and Fourteenth Street, New York, marking the ends of the shortest line which can be drawn across it within a very long distance.

Various companies have been organized to bridge the Hudson River, and we have illustrated the proposed structures. The construction of long span bridges has settled definitely into two types, the cantilever and the suspension systems. The beautiful Brooklyn Bridge over the East River, between Brooklyn and this city, illustrates the perfection of the suspension type, a type which always produces a graceful structure, the suspension cables tracing an approximate parabola in midair. The Forth Bridge is a monument of the gigantic and the ugly, the disproportion between its cantilevers and connecting trusses being primarily responsible for its appearance.

It crosses the Firth of Forth at Queensferry, in Scotland, and has two main openings of 1,710 feet span each. It is to be hoped that no structure of this sort will be built here. It would be a pity if the harbor of New York, with the Statue of Liberty and the Brooklyn Bridge, both objects of absolute beauty, were to have such an infliction as the Forth Bridge. Fortunately the action of the Secretary of War seems to prohibit it for the present at least, as will be seen below.

The Hudson River, as a navigable stream, is under federal control as far as legislation is concerned. The decision of the Secretary of War in the matter of the construction of a bridge over the Hudson River has been published within the last few days. It was elicited by the application for permission to build a cantilever bridge across the stream by the New York and New Jersey Bridge Company, the charter of the company providing that their plans must be approved by the Secretary of War. The main point of the decision is that the secretary forbids the construction of any bridge except one of single span.

We have illustrated two plans of bridges proposed for the purpose in question. One, the great Lilliendahl suspension bridge (SCIENTIFIC AMERICAN, May 23, 1891), was designed for a span of 2,920 feet, enough to go clear across the water. The other, a cantilever construction (SCIENTIFIC AMERICAN, June 16, 1894), with a maximum span of 2,020 feet, requires a pier in the stream. The latter feature the Secretary of War has decided to prohibit. This decision follows an exhaustive investigation of the subject made by a board of engineers appointed for the consideration of the question of the construction of the bridge.

The reports state that a single span bridge of either of the above types is safe. The distance between bearings is put at 3,100 feet. A cantilever of this span would cost twice as much as the 2,000 foot one, while a suspension bridge of the larger span would cost but one-third more than the smaller cantilever. A sum of $23,000,000 is estimated as sufficient for a six track suspension bridge. The gist of the decision is that it will be a suspension bridge or nothing.

There has long been a species of rivalry between engineers, and even nations, involved in the magnitude of bridges. For a while the United States, with the East River Bridge, led the world; now Great Britain, with its Forth Bridge, is in the van. When we have a 3,200 foot bridge crossing the Hudson River, we shall probably retain for many a year a proud pre-eminence in this branch of engineering.

When we consider that for the above enormous sum of money six or seven tunnels could be built under the river bed, which would be superior in their operations to a bridge, as they would distribute trains with their passengers along a considerable frontage of the river, and which would be more quickly finished and put in operation, it seems a wrong system to try to raise capital for the construction of the gigantic bridge, destined perhaps never to pay a dividend. Already a tunnel has been carried two-thirds of the distance across the river. If this should be finished and put in operation, the bridge might be relegated to future generations—it might be postponed until the bridge across the British Channel is commenced.

Soft Caps on Conical Projectiles.

It has been proved recently that the penetrating power of conical projectiles may be greatly increased by covering their ends with caps of soft metal. The discovery is one of great importance to naval engineers. It has long been known that hard metal projectiles are likely to be shattered on striking a plate of hard steel, thereby losing much of their force. Great efforts have consequently been made for years to provide the hardest possible surface for armor plates for the purpose of shattering the shots fired at it. The present discovery, it will be seen, will probably work a revolution in such methods.

The idea of capping the projectiles was suggested by the discovery that if a thin sheet of soft wrought iron be laid over a steel-faced armor plate, the latter failed to shatter a chilled steel projectile which had been fired at it with great force. A similar combination was effected by adding the soft metal to the head of the projectile instead of to the steel armor plate. In the subsequent experiments (which were carried out in Russia) the capped projectile was found to penetrate plates against which the best Holtzer shot was completely shattered. The caps were tried on a 6 inch conical projectile, and it was found that the most effective plan was to cover the 6 inch conical projectile with a cap 4½ inches long, having a thickness of ½ inch at the apex and ⅛ inch at the edges. It is probable that the good results obtained were due largely to the lateral support given to the hardened point by the soft metal thimble. It is suggested that the so-called Russian "magnetic" shot, concerning which there has been so much mystery, is merely a form of capped projectile. Similar experiments have been recently carried out at the United States naval proving ground at Indian Head, Maryland, with the same result.

A Forest Buried by Alluvial Deposits.

A remarkable instance of the rapid formation of alluvial deposits from overloaded streams has been discovered by the government geological expedition on the Yahtse River, in Alaska. This river in its course from the Chaix Hills to the sea passes through a tunnel in the Malaspina glacier, some 6 or 8 miles in length. When it finally emerges into the open air it is a very swiftly flowing stream of dark muddy water, 100 feet wide and about 20 feet in depth. Near the point where the river emerges from the ice it flows through a forest of large trees, and the gravel and sand carried along by the stream are deposited here to the depth of many feet. Some of the tallest trees still project through the deposit and retain their branches. The greater part, however, have been broken off and completely covered up by the sand. In other places the presence of vast forests is indicated by a few dead branches projecting through the deposits. In places where the deposits are thickest all signs of the trees have disappeared and in their place nothing may be seen but broad sand flats. These are inundated in stormy weather, and are of about the consistency of quicksand.

Distribution of Game in the State of Maine.

An interesting report on the distribution of wild game in the State of Maine has been made recently by the State Fish and Game Commissioners. A remarkable increase of large game, such as moose, caribou, and deers, is reported. The number of those who hunt this game has, however, increased fully twenty-five per cent during the year. The ruffled grouse, which are still quite plentiful, are being rapidly decimated, and this is true for the most part of other forms of small game. Fish culture as applied to land-locked salmon has been very successful. Some forty fine lakes and ponds were stocked with these fish during the year. The value of fish and game interests to the State is estimated at from $3,000,000 to $4,000,000. The commission ask for an appropriation of $30,000 per annum for the next two years for carrying on the propagation of fish and game. They also request that the State be thoroughly supplied with wardens to protect the game.

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A New and Successful Treatment of Typhoid Fever.

Some time ago Dr. Hugo Summa, of this city, a thorough physiologist and skillful practitioner, in considering the fact that there is an almost total absence of the usual signs of bile in the fæces of patients suffering from typhoid fever, came to the conclusion that possibly some of the distressing features of late typhoid may be due to a deficiency of bile, and determined to try the introduction of ox gall into the lower bowel in well marked cases of the disease. This plan has now been carried out in a considerable number of cases, and with the happiest results thus far, not a single death having occurred when the bile treatment has been instituted; whereas in a similar number of contiguous cases of apparently the same degree of severity the usual fatality has been noted.

The treatment is as follows: Two ounces of fresh bile (which can be obtained at any packing house and kept for two or three days if the air be excluded) may be mixed with from two to eight ounces of water and thrown into the rectum with an ordinary household syringe. Some patients cannot endure the bile of this strength, as it sometimes is quite irritating to the rectal mucous membrane; in which cases as much as fourteen ounces of water must be added to the two ounces of bile. The injection is given every night and morning.

Under the influence of the bile, conjoined with proper feeding, the course of fever has been very favorably modified in instances where the disease was far advanced when the new treatment was begun; in one patient at the City Hospital recovery resulted even after three severe hemorrhages had occurred, and in a large number of cases of typical typhoid in which the treatment was employed before the end of the first week the disease was checked in a very few days.

This is truly a remarkable showing. And if further use of rectal injections of diluted ox gall gives the same results as those already obtained in the hospitals of St. Louis, Dr. Summa will have given us a remedy second in importance to the recent cure for diphtheria. Full details of the treatment and results will be published as soon as its efficacy has been thoroughly tested.—St. Louis Clinique.

How to Buy a Horse.

An old horseman says: If you want to buy a horse, don't believe your own brother. Take no man's word for it. Your eye is your market. Don't buy a horse in harness. Unhitch him and take everything off but his halter, and lead him around. If he has a corn or is stiff, or has any failing, you can see it. Let him go himself a way, and if he walks right into anything, you know that he is blind. No matter how clear and bright his eyes are, he can't see any more than a bat. Back him, too. Some horses show their weaknesses or tricks in that way when they don't in any other. But, be as smart as you can, you'll get caught sometimes. Even the expert gets stuck. A horse may look ever so nice and go a great pace, and yet have fits. There isn't a man who could tell it until something happens. Or he may have a weak back. Give him the whip and off he goes for a mile or two, then all of a sudden he stops on the road. After a rest he starts again, but he soon stops for good, and nothing but a derrick can start him. The weak points about a horse can better be discovered while standing than while moving. If he is sound, he will stand firmly and squarely on his limbs without moving them, with legs plumb and naturally poised; or if the foot is taken from the ground, and the weight taken from it, disease may be suspected, or, at least, tenderness, which is the precursor of disease. If a horse stands with his feet spread apart or straddles with his hind legs, there is a weakness in his loins and the kidneys are disordered. Heavy pulling bends the knees. Bluish, milky cast eyes in horses indicate moon blindness or something else. A bad tempered one keeps his ears thrown back; a stumbling horse has blemished knees. When the skin is rough and harsh and does not move easily to the touch, the horse is a heavy eater and digestion bad. Never buy a horse whose breathing organs are at all impaired. Place your ear at the heart, and if a wheezing sound is heard, it is an indication of trouble.

Annual Report on the Ocean Postal Service.

During the past year the international sea post offices have been in continuous operations upon the fast steamers of the North German Lloyd line, the Hamburg-American Packet Company, and on the Paris and New York of the International Navigation Company. In all 147 trips have been made from Europe and 144 from New York. The mails are always dispatched by the fastest steamers, and when two fast steamers sail on the same day the mails are intrusted to the one whose records lead the postal authorities to believe will be the first to reach her destination. Other things being equal, however, the steamers sailing under the flag of the United States are given the preference. The steamers are paid for their services the amount of the postage collected on all the mail matter they carry from this country. The system has been perfectly satisfactory to all parties during the past year.

What Oculists in This City and in Chicago Say About Defective Eyes.

"About forty per cent of the people need to wear glasses nowadays," said a New York optician to a Mail and Express reporter. "But not all these people wear them. Four people in ten have some trouble with their eyes. It may be near sightedness, it may be simply weakness, it may be an inequality between the eyes; but whatever it is, there is a way to help it with glasses.

"A great many people have trouble with their eyes and do not know what it is; they attribute it to overwork of the eye sometimes, and sometimes lay it to headache or neuralgia, while it is merely the protest of a defective eye, that has been forced by will power to do work beyond its strength, or to keep up with the other eye.

"But people are learning now to take care of their eyes, and resort to artificial aid more promptly than previous generations did. A proof of it is the number of young people and little children who are wearing glasses. This does not at all indicate that the race is growing degenerate, but simply that it is learning to take care of itself, and these children in glasses will grow up to have better vision, that will also last them longer for it.

"It often happens, too, that children's eyes are cured of imperfections by glasses worn at an early age. The lens enables the eye to work normally, and a fault in formation sometimes is entirely remedied by it, and the child in later years is able to dispense with glasses altogether."

According to the statement of a Chicago optician, as many as nine out of every ten persons have something wrong with their eyes. Black eyes and brown eyes and blue eyes are all afflicted to about the same degree, unless it be that blue eyes are troubled with near sightedness a little more frequently than those of darker hue.

The troubles commonest with children and young people are myopia or near sightedness and hyperopia or far sightedness, and the latter predominates. But many are far sighted who are not conscious of it, and hence the trouble is seemingly less common than near sightedness, which is made apparent by the person so afflicted endeavoring to overcome the defect of vision by holding the object close to the eye.

HOW DEFECTS MAY ARISE.

The Chicago Journal says that near sightedness and far sightedness result from the improper focusing of the object by the lens of the eye on the optic nerve. The focal point falls before or back of the nerve center, and thus by an additional lens the defect of the lens of the eye is corrected. Sometimes but one of the eyes is defective, and again they are impaired in different degrees, and in either case a pair of spectacles in which the lenses are of the same power will not remove, but may increase the trouble.

By far the commonest defect of the eye is what is known as astigmatism, which, properly speaking, is the irregular curvature of the cornea or "watch crystal" portion of the eye. This defect may exist independently or be combined with other troubles.

Astigmatism may be of a vertical or horizontal form —that is, the eye may be perfectly rounded from top to bottom, but irregularly formed from side to side. To such an eye a perpendicular line would appear uniformly clear and distinct, while a horizontal line would look otherwise. By pasting black strips of paper representing the spokes of a wheel on a white surface and viewing them from varying distances, with either eye and both eyes at a time, any one can learn something of the condition of his or her eyes. As a matter of course, oculists all have various charts for determining defects of the eyes.

NATURAL IMPAIRMENT OF SIGHT.

The natural impairment of vision by age usually begins at 40 or 45. Any unusual trouble with the eyes during youth may cause the decay of sight to set in earlier, but ordinarily the impairment is uniformly regular, and the age of the person is the chief guide in the selection of proper spectacles.

The marvelous stories of "second sight" are misleading. What is known as "second sight" is the result of a change in the form of the eye by which the defect which caused near sightedness or far sightedness is corrected and the sight thereby improved. But the second sight is not the regaining of a lost power, but means the coming into the fuller possession of a function that in earlier years existed in an impaired condition. This is why persons who have been accustomed to wearing spectacles sometimes lay them aside in advanced years or old age.

It is probable that the sands of the seashore will be numbered and the leaves of the trees correctly counted about as soon as will be ascertained the number of cases of headache caused by nerve irritation arising from defects of vision. The stomach has had to endure a world of bitter medicine to remove troubles for which the eyes were wholly to blame. But it is easier to swallow any concoction that may be handy than it is to make an exhaustive study of the optic nerves and their remarkable influence on the health of the whole system. It is easier and cheaper to snuff camphor or smelling salts than it is to be examined for a pair of spectacles.

CURING "CROSS EYES."

Strabismus or "cross eyes" are now safely and almost painlessly corrected. The desired result may be obtained by the wearing of proper spectacles in early youth, but if the evil is not then corrected, an operation, later on, will be necessary.

The removal of a "cataract" from the eye is one of the most delicate operations performed by the oculist. A cataract is formed by the lens of the eye becoming opaque so as to appear grayish or otherwise, when it shuts out the light from the optic nerve. The oculist of to-day cuts into the ball of the eye and removes the darkened lens, and the optician supplies the defect by artificial lenses that make good the sight.

The demand for glass eyes is increasing as the character and quality of the eyes improve. Unsightly eye balls are now removed in part, leaving enough of the muscles to rotate the glass shell that is placed over them. Where the work is properly done the possessor of the glass eye can move it about with all the naturalness of a real optic, and in many cases it is very difficult to tell the manufactured article from the genuine.

All the wild stories about substituting rabbits' eyes for human eyes, or the statements to the effect that oculists can take eyes from their sockets, wipe them on a coarse towel and restore them unimpaired to the happy patient, are all moonshine, and any one who is called upon to listen to any such tales is perfectly justified if, under such circumstances, he should wink the other eye.

Dry Dock at Port Orchard.

The great dry dock at Port Orchard, Washington, now in course of construction, will be the second largest dry dock in the world, and in its general equipment one of the most valuable of such naval stations. A large tract of land on Puget Sound, 16 miles from Seattle, has been bought for the purpose and the work of building is well under way. It is to be equipped with a timber and concrete dock, 675 feet long, with a floor width of 67 feet. Its greatest width will be 130 feet and its depth 40 feet. The cost of construction will be $608,000, and it is stipulated in the contract that the dock shall be completed within three years.

The dock is being built in accordance with the latest knowledge in the construction of dry docks. The dock will be closed by a gate or caisson built in the form of a ship with a hull and a bow at either end. This will be constructed of iron. Its dimensions will be 91 feet in length, extreme breadth 24 feet, and a height of 38 feet from bottom of keel to top of waterway. The gate is pierced by twelve 20 inch filling culverts, each fitted with a gate valve. For emptying the dock, three powerful centrifugal pumps are provided, each of which is operated by a separate engine. In addition to this there will be a fourth centrifugal drainage pump. The steam for operating the pumps will be supplied by six large steel tubular boilers. The boiler pressure will be 100 pounds to the square inch, and the pumps will be capable of discharging 110,000 gallons of water per minute.

The gate is, however, the most interesting feature of the dock. The upper part is supplied with a water compartment provided with two 20 inch sluices, one of which opens into the sea and one into the dry dock. The gate is closed by filling this compartment with water and sinking it, the water being admitted through two 20 inch valves. When the gate is to be raised or floated, this water is pumped out. The main deck is supplied with a boiler and engine to drive a small centrifugal pump, capable of delivering 2,500 gallons per minute. The gate is handled by the aid of a capstan placed at the center of the upper deck and worked by a vertical shaft from the engine on the lower deck.

Test of the Gordon Gun Carriage.

The official test of the new Gordon gun carriage was made recently at Sandy Hook with very gratifying results. The contract called for the firing of ten shots an hour and offered a bonus of $2,000 for each shot beyond ten. In the test thirty-two shots were fired in an hour, thus making a bonus of $44,000 for the company. The carriage differs from those previously tested. It is built on a platform with a central pintle, and can be moved about in a circle. This is the only carriage for 10 inch rifles which can be moved in this way. When in position for firing it is 20 feet from the ground, and after firing it drops 8 feet to the loading position. It is supplied with two electric motors, one being used to pump the air for raising the carriage and the other for swinging the gun about on its pintle. The recoil is taken up partially by air pressure and partially by counterweights. The counterweights are placed beside the gun, thus providing some protection for the gun and the firing squad. The movements of the carriage may be controlled either by hand or by electricity.

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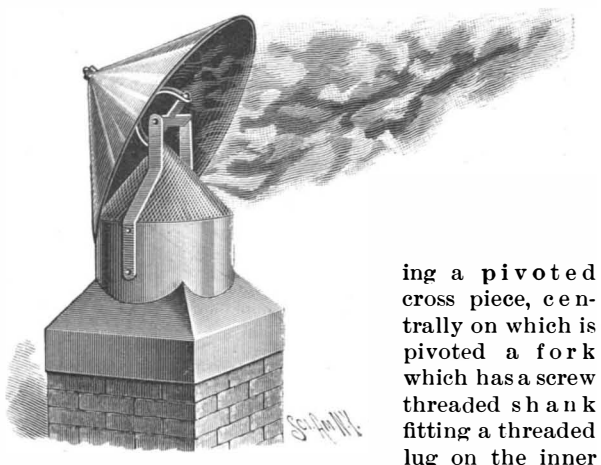
A CHIMNEY COWL OR VENTILATOR.

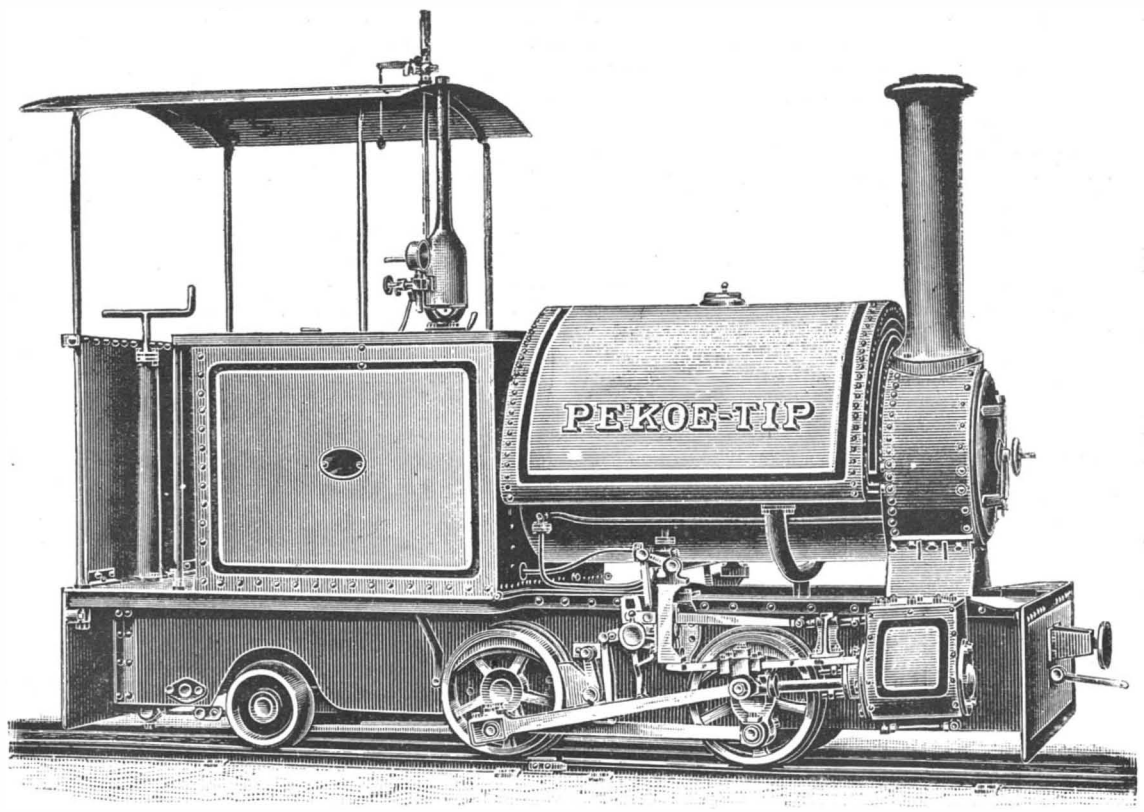
An inexpensive and simple device, for attachment to chimneys, air shafts, etc., is shown in the illustration, and has been patented by Mr. Milo H. Ingalls, of North Granville, N. Y. The cap is adjustable, so that it may be held at any desired distance from the flue top, and it is immediately responsive to the direction of even a light wind, thereby preventing any down draught and increasing the up draught, while keeping out rain, snow, etc. On opposite sides of the flue are inwardly and upwardly extending side arms supporting a pivoted cross piece, centrally on which is pivoted a fork which has a screw threaded shank fitting a threaded lug on the inner side and at the apex of the conical cap. Above the cap is a nut, holding the cap in place, while its supports form a universal joint permitting it to turn in any direction. The upper end of the flue is preferably provided with a conical spark arrester made of wire screening, and fastened to the flue by means of a bushing. Great advantages are claimed for this improvement as a ventilator for buildings, air shafts, passenger cars, etc., as well as in its employment as a chimney cowl.



INGALLS' CHIMNEY COWL OR VENTILATOR.

A TWO FOOT GAUGE LOCOMOTIVE.

We illustrate from the Engineer, London, below, a little locomotive constructed by Messrs. W. G. Bagnall, Limited, Stafford. The dimensions are as follows: Cylinders—diameter, 5½ inches; stroke, 9 inches; wheels, four-coupled—diameter, 2 feet; centers, 3 feet; wheels, bogie, diameter, 1 foot; total wheel base, 6 feet; boiler, Siemens steel; firebox, Siemens steel, circular; tubes, steel, 1½ inches diameter; heating surface—tubes, 80 square feet; firebox, 10 square feet; total, 90 square feet; grate area, 3·28 square feet; fuel capacity, 7 cubic feet; water capacity, 140 gallons. The engine is made for a 2 foot gauge, and is fitted with Baguley's patent valve gear.



NARROW GAUGE LOCOMOTIVE.

Facts About Fatigue.

Dr. Tissie, a well-known French physician, has been studying the subject of excessive physical culture. He points out, in Science Siftings, that there is a similarity between the nervous fatigue which follows violent and prolonged exercise and certain hypnotic states. All fatigue is in the nerves; the muscles simply lose their power. In violent and prolonged physical exercise the waste of the body is rapid and extreme, and at the end its victim is in a state of poisoning from the accumulation of waste products in his system not yet thrown off. He is like a patient recovering from some disease. The muscular overstrain in the case is like that which results from such nervous shocks as are sometimes produced by violent emotions or by dreadful dreams. Dr. Tissie made a special study of the case of a runner in a "go-as-you-please" race which continued twenty-four hours. The first effect of the nervous exhaustion was a feeling of great fatigue, followed by loss of interest and disgust. Next came phenomena of illusion or hallucination, of double personality, loss of memory, and great need of sleep. The doctor claims that the real aim of every trainer for the ring is to produce an automatic state in the one who is to take part in the contest of physical strength. His whole science is to transform the man he trains into a being that will keep on automatically Something of this occurs in all overstrain from prolonged physical exercise. The plodding action which results is akin to the constant repetition of the same word, over and over, until it becomes a fixed idea in the mind. The doctor's conclusions are that the abuse of athletic sports is an evil; that the players lose character and tend to retrograde from intellectual volition to a habitual automatism. Just as moderate exercise is good, so these intensive exercises are bad.

The Tea Industry in Japan.

The United States consul at Nagasaki says that in that Ken tea cultivation is conducted as follows:

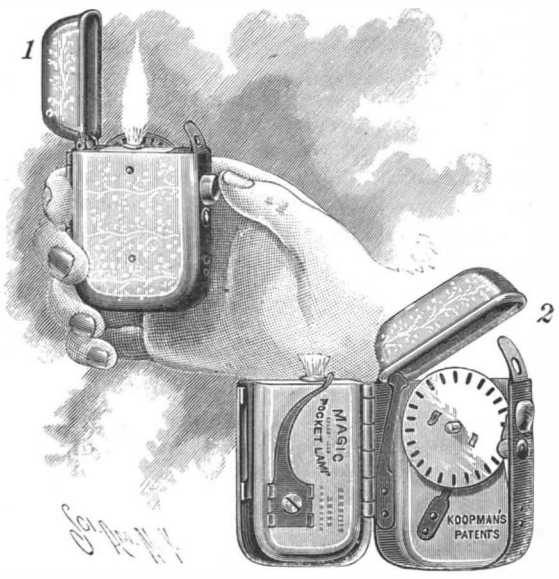
On inclined ground the tea is planted in furrows, but on level ground the plants are grown separately. The space between each row is about three and a half feet. On the hillsides it is planted in rows, but on the plains and near the houses it is grown in circular patches. After the first and second leaves are picked the branches are cut with shears. The object in cutting is mostly to make the plant round or semicircular. Formerly the plant was cut down to the ground every three years. The ground is cultivated three or four times in the spring, summer, and autumn. The grasses are cut and manure applied twice a year—in spring and in autumn. For manure, night soil, green weeds, accumulated soil, oil cakes, and fish are used. These manures are used only for plants near people's residences; for those on the hillsides, weedings are performed twice a year, in spring and in autumn, and the weeds are used as manure.

The season for gathering first tea buds or leaves begins on the first or second of May; but in some localities first leaves are gathered about the 20th of May. Second buds or leaves are generally allowed to grow, unless the market price is very high, or the first leaves gathered are found much smaller than usual. In the vicinity of Omura and Hirado, however, they gather both first and second leaves. In picking leaves for the best tea, three tender leaves are picked together; for the middle and lower classes of tea, five leaves are picked at once; and for the lowest, all the young leaves are gathered. In picking leaves women are usually employed. The average quantity of the three leaves picked by a woman is from ten to thirteen catties a day (a catty is equivalent to 1·31 pounds avoirdupois). The manufacture was formerly conducted in two ways, namely, by drying in the iron pan, or in the sun, then drying in paper utensils was introduced, and more recently, drying in bamboo baskets came into vogue. The method of drying in the iron pan is still extensively used.

For manufacturing black tea, the Indian method was formerly followed, but at present the Chinese method is adopted. For sorting tea leaves heated in paper utensils, round and square sieves are used, and for rolling utensils, either case or bag is used. Night soil, oil cake, dried fish, green grass, and weeds are considered the best manure for tea plants. The hours of labor are from 5 in the morning until 6 in the evening. The daily product per man is as follows: With the iron pan, about thirty catties; with the paper utensil, about twenty catties; with the bamboo basket, about forty-five catties. The women are employed only at steaming the tea leaves, and are paid only half the rate of the payment to the men. When the season arrives, the workmen are hired daily, the farmers helping each other. In Omura, contracts are made beforehand by advancing money about January or Februarv.

A POCKET LAMP AND CIGAR LIGHTER.

The convenience of having in one's pocket a small self-lighting lamp which is always ready for use, and which takes up no more room than an ordinary match box, is afforded by the "Magic" pocket lamp and cigar lighter, shown in the illustration, and which has been put on the market by the Magic Introduction Company, of No. 371 Broadway, New York City. The



A POCKET LAMP AND CIGAR LIGHTER.

case is an ornamental one, silver or nickel plated, and by pressing with the thumb upon a spring button, the cover flies open and a wick protruding from a little oil reservoir is lighted. When the spring is only partially pressed in, the cover opens without lighting the wick, but the stronger pressure upon the spring causes also the simultaneous revolution of a lighting disk, whose edges are marked with small deposits of match composition, the passage of one of which under a spring finger lights the wick. The relative positions of the lighting disk, the igniting finger, and the wick may be seen with the case open, as shown in Fig. 2. With a complete outfit a small bottle of oil is furnished, with a filler and a number of extra lighting disks, all in a small package, but any good oil can be used instead of that furnished by the company, very little oil being ordinarily required, only just sufficient for the saturation of the wick, thus avoiding any possibility of soiling the clothing. The lighting disk is reversible for use on both sides, and is readily replaced by a new one when its supply of fulminates is exhausted. That this is an eminently practical device, quite dissimilar from the numerous failures which have been put forth in this field, is well attested by the fact that more than half a million of them have already been sold, and the demand continues.

The Philosophy of Skating.

Considerable time and ingenuity has been expended this year in the effort to produce a form of skate which will combine lightness and convenience of arrangement with great speed. The scientific principle involved in this work is far more complex than is generally supposed, and makes a very interesting study. Speed in skating is of course attained by the proper application of every particle of motive power. When the skater strikes out with his foot he does not, however, as is generally supposed, obtain momentum from the broadside pressure of the skate on the ice. The momentum is gained by a gradual and tapering pressure which commences at the head of the skate, since it is here that the freshest and strongest force is applied. It will be seen that the momentum is increased, therefore, by the pressure exerted steadily and firmly outward from the heel of the skate to the extreme toe. The proper way to attain great speed is to strike out each foot as close to the other as possible, to continue the stroke up to the toe, and when once the extreme motive power is passed, to get the other foot in position as quickly as possible. The prime factors in producing speed, it will be seen, are the full pressure on the ice and the rapid movement of the legs. Working upon this theory, a long heavy skate has been manufactured, with a blade which extends several inches beyond the foothold.

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Curious Artificial Fuels.

The Patent Office at Washington has at present a very curious assortment of contrivances patented for cheapening the cost of fuel. Some of the ideas are exceedingly interesting. One patent provides for using corn cobs soaked in petroleum, another would have people cut leaves and grass when green and press them into compact blocks. It is claimed for this particular patent that such blocks might be used for building and fencing without impairing their value as fuel. There are, besides, many devices for utilizing coal dust. One proposes to mix clay, molasses and water, coal dust and petroleum. Another mixture is that of saw dust, Irish moss, asbestos fiber and burnt limestone, these being boiled and made into bricks with coal dust. Then there is a patent for bricks without coal dust, to be composed of ashes and sawdust saturated with petroleum and coated with resin. Among the most curious ingredients for artificial fuels are clam shells, charred garbage, corn meal, wheat flour, sugar, sea weed, broken glass, lard, tar and leaves.

One of the most interesting of these contrivances is composed of powdered charcoal and finely cut cork. The fuel burns very slowly and gives off a great deal of heat, being particularly well adapted for the sick room. Exclusive rights have been taken out for the manufacture of a brick or cartridge of highly porous clay, which is to be soaked in kerosene and put in the kitchen stove when wanted. It is only necessary to touch a match to this and the fire is ready for cooking. None of these, however, are more ingenious or economical than a fuel which is reported to be in use at present in Egypt. In this case Egyptian mummies, chiefly those of cats, ibises and other animals held sacred by the ancients, are employed.

Essentials in a Healthful Home.

The site for a house should receive careful attention of the tenant, purchaser, or of one proposing to build. A good site may mean life and happiness, and a bad one disease, suffering and death.

First.—It should be dry. Avoid, as you would death, a damp location. In a town or city carefully ascertain whether or not it is on "made ground." Avoid it. Avoid ground underlaid with clay, for it will always be damp.

Second.—Elevated on a hillside or gentle knoll, never in a hollow. The hillside is warmer and drier than the hollow.

Third.—Not close to a swamp or slow river, milldam or land which is overflowed a portion of the year, nor in such a place that the prevailing winds will bring to the house pestilence from a milldam, etc.

Fourth.—In as good a neighborhood as possible, away from factories, saloons, etc., and near schools and churches.

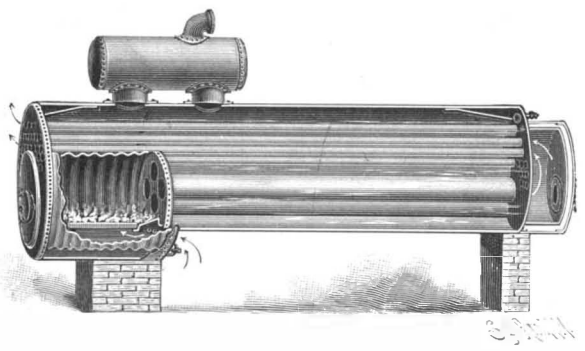
Fifth.—In a village or town build on as large a lot as possible, thus securing air and sunlight. Build back from the street, thus avoiding the dust of the dry season and the curious gaze of every passer. Secure a yard in which trees and plants will furnish both exercise and health.

Sixth.—In the country build back from the highway, giving an abundance of room for trees and shrubbery about the house. Do not select a place where your family will be isolated from all social intercourse, so necessary to the health of mind and body.

For the aspect, let the house be so placed that it will receive the most sunlight and fresh air, especially from the summer winds. Avoid, even if offered rent free, a damp, dark house, with no chance of the free air of heaven to sweep through it. If the house is only one room deep, it does well to face it to the south or southwest; but if it is two rooms deep, those on the north side never receive any sunlight, and are apt to be damp. For a double house it is best to face it to the east. Then the morning sun will warm up the front and the afternoon sun the rear of the house, and thus all the rooms will be bathed in light and warmth. The living rooms should always be warmed by the morning sun. This hint is worth a great deal as a health matter. For when the sun cannot enter, the doctor must enter. If the cold winds from the north and west are severe in the winter, they may be broken by a cluster of evergreen trees planted on those sides. In country places a good aspect should be secured without reference to facing the house square with the street.—Pacific Health Journal.

AN IMPROVED STEAM BOILER.

In the boiler shown in the illustration the fire box as well as the entire body and barrel of the boiler are cylindrical, the improvement being designed to render the boiler more safe and less expensive in construction than the usual locomotive and marine boilers. For this invention a patent has been granted Messrs.

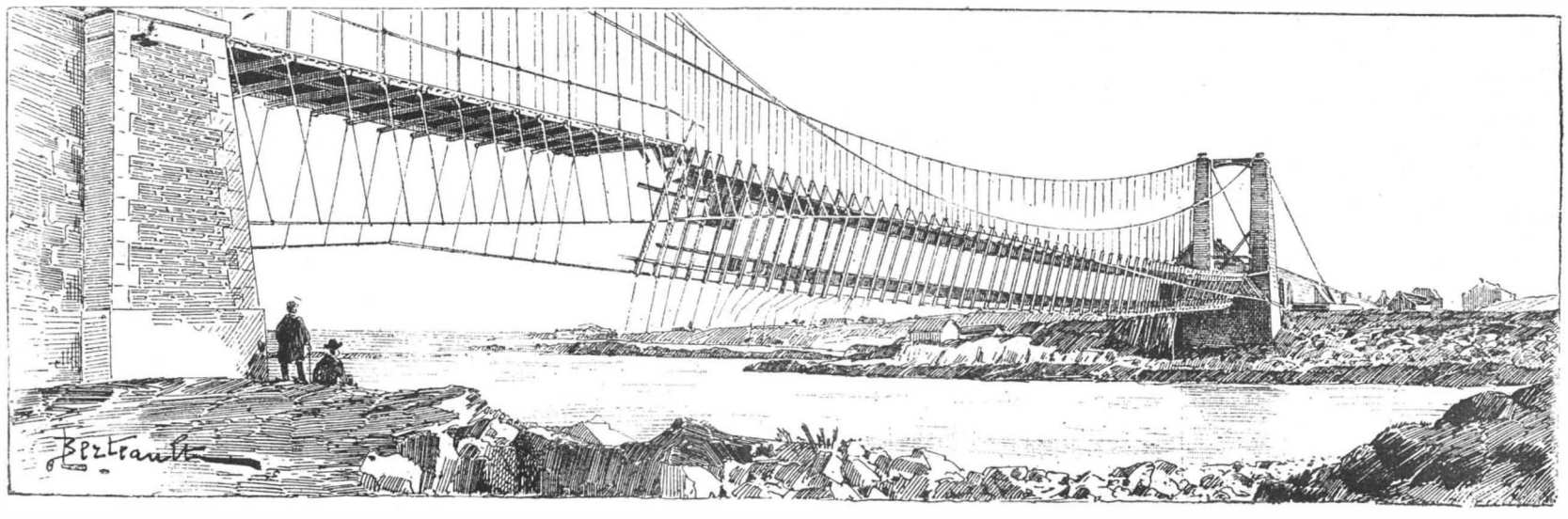


WALTZ AND PATTON'S BOILER.

George H. Waltz and Lucius E. Patton, Memphis, Tenn. (address in care of U. S. local inspectors). From the front cylindrical shell extends rearwardly a barrel of smaller diameter, the fire box in the front portion being circular, and either corrugated or having re-enforcing rings. In the front head is riveted a collar through which the shell of the furnace extends, its rear portion being located in an intermediate head, from which four or more large flues lead to a firebrick or tile-lined smoke box. The larger shell forming the front portion of the boiler and the main barrel are connected by means of a throat, the parts being preferably joined by hollow stay bolts, through which air is supplied below the grate and in front of the gases passing into the large direct flues. In the sides of the front shell are tubes of different diameters, capped to exclude cold air, these tubes taking up the surplus space and acting as stays from the front head to the throat. In both ends of the hollow standards connecting the steam drum with the boiler are sieves, to prevent moist steam entering the drum, and perforated pipes, below the furnace, close to the bottom of the shell, are connected with blow-off valves, to take up and remove sediment from the full length of the bottom. With this construction the furnace, fire tubes, and flues are entirely submerged beneath the water of the boiler.

A SUSPENSION BRIDGE BREAKS DOWN.

The great tempest which visited France on November 14 ruined the bridge known as "Pont-Lorois," situated on the River Etel, on the route from Port Louis to Auray, in the district of Lorient. At the northern end of the bridge part of the iron suspension ropes which secured the roadway to the cables were broken, and a large section of the roadway assumed the position shown in our engraving, the boards having been torn off. Fortunately this accident did not result in the loss of life, though it occurred at half past eleven in the morning. The bridge is 110 meters long (360 feet) and is 12 meters from the water at high tide and 17 meters at low tide. We are indebted to L'Illustration for our engraving.



THE LOROIS BRIDGE OVER THE RIVER ETEL, INJURED BY A STORM.

The Electric Welding Patent.

In the United States Circuit Court for the Eastern District of Wisconsin, in the case of the Thomson Electric Welding Company against the Two Rivers Manufacturing Company and others, the action was a bill in equity by the Thomson Company against the Two Rivers Company and others for infringement of certain patents for electric welding. Complainant moved for a preliminary injunction. In his decision Judge Seaman said:

There has been no adjudication of the validity of these patents, and, so far as appears, no opportunity has arisen heretofore for testing their validity. Has there been public acquiescence in the claims here asserted of sufficient definiteness and duration to afford presumption of validity? This inquiry must depend in each case upon all the circumstances shown. Here was clearly an assertion of a new art and apparatus for welding.

Its discovery was widely published and accepted by the scientific world in Europe and America and by the public generally as novel and important. It was speedily put into operation by the complainant, and its machines and rights for their use were at once sought by manufacturers and metalworkers, and it is unquestioned that the process had extended to an important share of the welding of metals throughout the country when the defendants entered upon its use. With an asserted invention of this character and utility and operation under it firmly established since 1888, and to a considerable extent supplanting the older methods, I am satisfied that there is a sufficient showing of public acquiescence and that "there arises such presumption of the validity of the patent as to entitle them to a preliminary injunction to restrain its infringement, unless the party sought to be restrained can clearly show its invalidity." (Blount vs. Societe Anonyme, 3 C. C. A., 455; 53 Fed. Rep., 98; Sargent vs. Seagrave, 2 Curt., 553; Fed. Cas., No. 12,365; Sessions vs. Gould, 49 Fed. Rep., 855; 3 Rob. Pat., secs. 1185-1188.)

The remaining question is whether the defense have given a clear and convincing showing, first, that the invention was merely the double use or analogous use in the art of a process previously known; or, second, that it was fully disclosed in previous publications or patents and actually practiced as a welding operation prior to these patents, which should be held to overcome these presumptions and re-enforcing affidavits produced by complainants. Great research and ingenuity appear in this defense, but I am constrained to the opinion that neither proposition is maintained to the degree required for preventing an injunction, and that their determination must be postponed to final hearing.

They present the story frequently interposed against valuable patents of laboratory experiments, of announcements, and of patents which may have come to the verge of this discovery; but the demonstrations are not clear, and the important fact stands in their way that they do not appear to have accomplished the electric weld which is shown by Thomson.

The employment of heat and pressure for the operation of welding metals is old, and it was long known that heat could be obtained by the application of an electric current. These were not Thomson's discoveries, but he found a method for employing the electric current, localizing the heat at the joint to be welded, and applying simultaneously the requisite pressure, so that the separate pieces of metal could be properly united. I am not saisfied, for the purposes of this motion, that he was anticipated in this by Despritz, Joule, Plante, Cruto, or any of the patents shown, or by any experiments of Daft or Johnson. In this view the complainant is entitled to an injunction pendente lite against infringement of letters patent Nos. 347,140 and 347,141, and injunction will issue thereupon. With reference to letters patent No. 385,022, all determination will be postponed to final hearing.

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Correspondence.

Aerated Bread Still Made in this Country.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to an article in your last number, page 359, on the subject of aerated bread, I beg to state that the process of bread making by this method was introduced by me, as the medical superintendent of both the State Hospitals for the Insane in New Jersey, at Trenton and Morris Plains, many years since—at the former thirty and the latter eighteen years ago, or when it was opened in 1876, and that it has been continued in both without interruption to this date. The number of inmates, sane and insane, now supplied with bread in the two institutions by this process is about 2,500. The bread is tender, light, sweet and, so to speak, mechanically clean, as the materials are not touched by the hands during the process.

The method used differs from the Dauglish system mentioned. Instead of charging the water for mixing the flour with carbonic acid gas, the latter is supplied by a force pump to the dough during the process of kneading, in the usual cast iron globular vessel.

Regarding the process, as I do, as the greatest improvement in the culinary art made during the century, it seems surprising that it is not in general use.

It is presumed that the two State hospitals mentioned are the only ones in the world in which aerated bread is made. H. A. BUTTOLPH, M.D.

Short Hills, N. J., December 8, 1894.

[FROM THE CHICAGO RECORD.]

Progress of Compressed Air.

Railroad passengers are frequently surprised by the unexpected entrance into the cars of a group of chattering, bareheaded women. Those who do not recognize them as car cleaners and dusters wonder who they are and how they boarded the train. The women usually appear several blocks from the terminal station, and so proficient are they in the art of "flipping" a train that the engineers do not come to a full stop when they see their feather dusters and brooms beside the track, but reduce the speed somewhat and the women swing on as neatly as brakemen. When the last passenger has left the train, the women take possession of the cars. They are all healthy and muscular, quick with the broom and active with the feather duster and chamois skin, and by the time the cars are thrown on the cleaning switch they have the floors well cleaned of peanut shells. paper, and cigar stubs, and are ready for the seat cushions.

On some of the roads the women still carry the cushions outside of the car and beat the dust from them by whipping them with willow beaters. But compressed air has taken the place of the paddle on most of the roads. The hose which contains the compressed air is run into the car through a window or door, and the women, handling it as they would a garden hose sprinkling the grass, turn the jet of hissing air upon the plush cushions and the dust flies out. No whisk broom, willow paddle, leather strap, or beater can get at the dust as compressed air does. The jet searches every crack and cranny and drives the dust from the very wood itself. Sometimes the women turn the air upon the window casing, and in a jiffy it is clean of dust.

The man who makes air compressors cited this novel use of compressed air as another point in favor of the claim made by his craft that compressed air was just beginning to enter into the common everyday work of the world. He added that few persons knew the uses to which compressed air was put outside of stopping trains, drilling rock, and inflating bicycle tires.

"Electricians think that this is the electrical age," he said. "Well, perhaps it is, so far as lighting, telephoning, telegraphing, and welding goes, but when it comes to the transmission of power they are talking too much. They have worked and studied for years to make an electric rock drill which would take the place of the air drill, but they have not succeeded. They have tried to make an electric train brake which would bring a limited express train to a full stop sooner than the automatic air brakes will do it, but they are so far behind that they will never catch up. It will not be long before street cars will be running with compressed air as the motive power, and they will be safer, more easily controlled, will run as fast, will stop quicker, will wear longer and will be operated at less expense than the best electric system they can put on rails. With a good air compressor, air at any pressure can be stored up in a reservoir or steel tank, and can be taken to any point within reasonable distance as economically and with less waste than electricity can be sent by wire. The air compressor is a pump which is part of a stationary engine. The piston in the air chamber first sucks the air in, and then forces it through a pipe to the reservoir. Of course the more air one pumps into the reservoir, the greater pressure to the square inch one gets. The compressed air works like steam, except that it is cold and has not the expansive qualities of steam. But steam cannot be carried through pipes out of doors to any great distance, for it would lose its heat, would condense, and soon turn back to water.

"Cleaning cushions by compressed air is one way of using it that few people know of. Visitors to the sanitary canal are always interested in the rock drills which bore the holes for the dynamite cartridges, and almost everybody knows that the brakes of passenger trains are operated by compressed air.

"I know a machine shop where there is not a belt, a piece of shafting, or an electric wire, for all the machinery, from a little emery wheel to a twenty-ton crane, is operated by compressed air. The shop is traversed by large pipes from the air reservoir, and from these main pipes smaller pipes lead down to the machines. Each machine, whether drill, planer, shears, lathe, bending rolls, milling machine, punch, drop hammer, press, or cold saw, has its own motor or engine, and the mere turning of a valve starts or stops the machine.

"A pneumatic clock system has lately been installed in the new Criminal Court building in Chicago. Pneumatic clocks are not new, for they have been used in Paris for twenty-five years. Now over 10,000 clocks are operated and regulated from the central clock by compressed air.

"The pneumatic clock system installed in Paris twenty-five years ago was the beginning of the compressed air central power system, which supplies over 10,000 horse power to users in the French capital. It is used there for all purposes, from running clocks to operating dynamos for electric lights. The central station furnishes air at a pressure of seventy-five pounds to the square inch. It is sent around the city under the streets in pipes, and is sold to customers by meter, just as gas is.

"The solution of the smoke problem in Chicago is easy. Put a central power station where the smoke will bother no one, and from this station send electricity, high pressure water, or compressed air to the business center and to the stock yards. The cheapest power that can be used in this way is compressed air. Elevators, printing presses, wood and iron working machinery, and, in fact, anything operated by steam can be operated by compressed air. Some day we shall have pipes for compressed air under the pavements of Chicago streets, and there will be no smoke if the tugboats and locomotives can be subdued."

Asphalt used for street paving is refined by compressed air. In its original shape, just as it comes from Trinidad, asphalt is too soft for street paving and is not homogeneous. To refine it the asphalt is boiled in kettles for three or four days, and while the heat is on it must be constantly stirred. Pipes with numerous holes are placed in the bottom of the kettle, and while the asphalt is boiling, compressed air is forced through the pipes, and, escaping through the holes, it agitates the thick, black stuff. At first the air comes to the surface in big bubbles, and the asphalt slobbers all over the inside of the kettle, but at the end of three days the asphalt has become so thin that the air makes it boil in little bubbles, and it is then drawn off in barrels, where it cools hard and even.

In France they make a sort of silk from wood pulp by the aid of compressed air. The wood pulp is put through a chemical process which changes it to a sticky substance like gelatine. It is then placed in a closed tank and compressed air is introduced. The air first presses the substance through a filter and then into a smaller tank which is under the large one. This tank is in a horizontal position, and from it spring hundreds of glass pipes, in each of which the hole is about the size of a silk fiber. The wood pulp is forced through these tiny holes and comes out in the shape of threads so fine that six of them are required to make a thread strong enough for weaving.

Compressed air was the paint brush which placed the color on the World's Fair buildings, and which to-day is painting railroad bridges and corrugated iron plates for buildings. The compressed air not only draws the paint from the tubs to the place where it is to be used, but by atomizing the paint, sprays it over a large surface and drives it into the wood. In the big shipyards of Cramp & Sons Philadelphia, where government armored cruisers are built, all the calking of warships is done by compressed air, and one compressed air calking machine does the work of four men. This calker can strike 1,000 blows a minute.

The same tool in a modified form is used by stone cutters for dressing or carving granite. The little engine which does the work is in the handle of the tool, which is about as large as a chisel handle. The air is brought for the tool by a small rubber pipe, which is so flexible that it can be handled easily and at any angle. A piston and spring shove the tool in and out, and it can be so regulated that the most delicate work can be done with it.

Many of the dump cars on the sanitary canal are dumped by compressed air. A pipe leads from the locomotive which hauls the cars from the working in the canal to the dump or spoil bank, and when the train of cars is in the proper place the engineer turns a valve, the compressed air shoves out the piston in the air cylinder under the cars, and the dirt is dumped.

In the slaughter houses in the stock yards the cattle are jerked up from the floor by compressed air after they have been killed, and in the rolling mills steel rails are lifted from the cooling beds in the same way.

Acids, which would eat up a pump before the engineer could shut off a valve, are raised from vats to the shipping room in factories by compressed air. Sewage which is below the grade of sewers is forced up to the proper level by compressed air. Impure water is cleaned, gold and silver are dug from mines, letters are copied in the letter press, elevator signal bells are rung, furnace grates are shaken, sewing machines and jeweler's lathes are run, crude oil is atomized under steam boilers, railroad switches are thrown and railroad gates opened, passenger and freight elevators are lifted, grain is cleaned, the pressure of natural gas is increased, letters and packages are carried, and a hundred other things, of which nothing is ever said, are done by compressed air. And every week something new is found for it to do.

The Secret of Long Life.

M. Barthelemy Saint-Hilaire, the famous French scholar and politician, who recently entered on his ninetieth year full of physical and intellectual vigor, has been telling the inevitable interviewer how it is his days have been so long in the land. It is, we are told, the effect of strict adherence to the old precept "early to bed and early to rise," with steady work during waking hours. Every grand old man seems to have a secret of his own. Mr. Gladstone, we believe, attributes his longevity to his habit of taking a daily walk in all weathers, and to his giving thirty-two bites to every morsel of food. Oliver Wendell Holmes pinned his faith on equability of temperature. The late Major Knox Holmes swore by the tricycle, which, in the end, was the cause of his death. Dr. P. H. Van der Weyde, an American octogenarian, not long ago offered himself "as an example of the benign influence of the study and practice of music."

Some aged persons give the credit of their long lives to abstinence from tobacco, alcohol, meat, or what not; others to their indulgence in all these things. One old lady, of whom we read not long ago as having reached the age 120 or thereabout, maintained that single blessedness is the real elixir vitæ, and she ascribed the death of a brother at the tender age of ninety to the fact that he had committed matrimony in early life. M. Ferdinand de Lesseps believed in horse riding. Mr. James Payn complains that in his boyhood he "got a little bored with too much horse." The Grand Francais seems to think that one can hardly have "too much horse." In a letter recently published, M. De Lesseps delivered himself on the subject as follows: "I shall always be deeply grateful to Larine, my riding master, who from my earliest years made me share his keen passion for horses, and I am still convinced that daily horse exercise has in a large measure been the means of enabling me to reach my eighty-fourth year in perfect health." Carlyle was also a great rider almost to the end of his long life, and he not only rode, but, we believe, groomed his horse himself. On the whole, it must be concluded that the real secret of longevity is a sound constitution prudently husbanded. The only general rules that can be laid down are those set forth by Adam in "As You Like It:"

"Though I look old, yet I am strong and lusty;
For in my youth I never did apply
Hot and rebellious liquors in my blood,
Nor did not with unbashful forehead woo
The means of weakness and debility;
Therefore my age is as a lusty winter,
Frosty but kindly."

That is the whole secret of long life. Shakespeare knew it as well as any one, yet he died at fifty-two.—British Medical Journal.

The Northmost Mine.

The northmost mine in the world, known as the "Omalik" mine, is situated on Fish River, in the extreme northwestern part of Alaska, near Golovin Bay. This point is one thousand miles northwest of Sitka, the latitude being 65° north, longitude 164° west. The ore, which is found in rich veins, is galena, consisting of 75 per cent of lead and carrying 143 ounces of silver to the ton. On account of its extreme northern position, it is, of course, impossible to work the mine during the winter season. The work is carried on by a picked body of men, who make the trip in an especially chartered ship every spring, and return early in the autumn. The provision and mining equipment must, of course, be carried by the mining party, since the mine is far from the borders of civilization. The party report that the Esquimaux are a peaceable people, and are very quick to learn the ways of the Americans. In many cases they are employed about the mine with very satisfactory results. It has been the experience of this party that the climate in Alaska is not so severe as is generally supposed. The summers are warm and pleasant. All of the party are enthusiastic over the immense resources of Alaska, and prophesy a bright future for the country.

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THE SOCIETY OF THE NEW YORK HOSPITAL AND ITS NEW HOUSE OF RELIEF.

The Society of the New York Hospital has recently completed and put in operation an emergency hospital termed the House of Relief. This building is situated ou Hudson Street, on the corner of Jay Street, in this city, in the heart of the downtown district. The plot of ground on which it is erected has streets on three sides, Hudson, Jay and Staple Streets, in itself a most fortunate circumstance, as affording free circulation of air. The building has been set back from the adjoining building on Hudson Street, so as to form an alley, thus leaving the fourth side also free and giving light and air from all quarters. The structure, which is fireproof throughout, and which embodies all the last refinements in hospital construction, was designed by the firm of Cady, Berg & See, the well known architects of this city.

The old House of Relief, known commonly as the Chambers Street Hospital, occupied an old police station which had been assigned to its uses by the city. But the work long ago outgrew the restricted quarters, and the society determined to build and equip a model hospital for emergency cases. Although its correct title is widely published, the new House of Relief is already receiving the title of the Hudson Street Hospital. This new building is a model hospital and has been selected as the subject of this article owing to the perfection of the methods and the completeness of its equipment. Our illustrations show the work done in different departments, for the operations are classified in three divisions. The first is for emergency treatment of accident and sunstroke cases; the second covers the dispensing of medicines: and the third is devoted to the definite treatment of patients who cannot be sent away to their homes or to other hospitals. The emergency work is the great feature of the house.

The building is shown in Fig. 3 of the cuts. The main entrance is on the center of the Hudson Street front, and to one side is seen the ambulance gate and alley. The ambulance enters by this alley and goes out on Staple Street, at the rear of the building. The entrance of an ambulance is shown in Fig. 5. The gates are held shut by a latch operated from within the building by electricity. When the ambulance arrives, the attendant or driver presses an electric bell push which rings a bell within the building. The electric latch is at once released from within, the ambulance enters and the gate is closed behind it.

If the case is one requiring instant attention, the patient is taken to the operating room on the ground floor, which room is shown in Fig. 8. Here, as through all departments, antisepsis reigns supreme; sterilizers and sterilized solutions are on hand, and the beginning of the treatment is made under the best auspices.

If the case is one of sunstroke, the patient is taken to the special sunstroke ward on the same floor. This is shown in Fig. 7. The apparatus is probably unique. It includes an electric crane of 600 pounds lifting capacity, for raising the patient bodily. A bath tub on wheels is used to receive the patient. This contains water (often ice water is used) for the reduction of temperature by what may be termed a phase of the "heroic treatment." It often happens that the patient is immersed in the cold bath without even having his clothes removed, as expedition in such cases is of great importance. The cot is wheeled next to the tub, to receive the patient as he is lifted from his cold immersion. In the cut the switch for operating the crane is seen on the wall in the background.

The dispensary, which serves a number of patients of all kinds, some of the lowest classes and some of foreign origin, is shown in Fig. 1. Here medicines are distributed without charge to patients of the house. These patients are not all inmates of the building, as there is a special "Out-Patient Department," which this dispensary, to a great extent, supplies with medicines. A visitor going up in the electric elevators will find the surgical room, Fig. 4, on the third floor, fitted up in accordance with the most advanced ideas of modern surgery. Dr. Lewis A. Stimson, the attending surgeon, personally designed the arrangements. Here amputations and other capital surgical operations are conducted, always under most perfect antiseptic conditions.

On the same floor are the reception wards, one of which is shown in Fig. 2. These wards are primarily for the treatment of patients whose condition is too critical to warrant removal to other hospitals. But many patients are received, treated, and dismissed well or convalescent from these wards.

An interesting feature of the building is shown in Fig. 6, the roof garden. This tells its own story. Far above the level of the streets an inclosed space upon the roof has been fitted up for convalescent patients or for those to whom sunlight and air are first necessities. An iron railing surrounds it and a wire netting extends over the top. When in use awnings will be stretched across the top to give shade and exclude sunlight as desired.

The building is adapted for hard use, for in it the most critical cases of injuries, requiring instant treatment, are received. The floors are marble or tile mosaic for the most part. The hose can be turned freely on these, so as to wash down the building from top to bottom. The wooden floors of the wards are of quartered pine, made waterproof by paraffine wax and varnished.

The ventilation problem is dealt with on the forced draught system. Two fans draw air from above the roof and force it into the different rooms through independent ducts, whose outlets, placed high above the floor, are provided with deflecting shields to direct the air upward, so that no draught can be felt. Each of these inlets has a handle, by which the air can be caused to enter at the outside temperature or can be caused to be heated before admission, or hot and cold air can be mixed to get any desired temperature. In addition to the fresh air fans, there are other fans for drawing out the air from all parts of the building, discharging it at a safe distance from the windows or fresh air inlets.

The above is one of many details of construction which are encountered everywhere in the building. Thus the elevators, laundry machinery, pumps, fans, etc., are driven by electricity. It must also be noted that we have described but a small portion of the hospital appliances, for within the restricted area of 50 by 95 feet is a perfect miniature hospital. There is an "isolated room" for suspicious or noisy cases, rooms for the storage of patients' clothes, eight examination rooms, dining and reading rooms for doctors and nurses, besides the kitchen and electric steam laundry.

The Society of the New York Hospital is a corporation whose operations in the amelioration of the ills of humanity date back to January 3, 1791, when their hospital work began. Old New Yorkers remember the building situated on the west side of Broadway, opposite Pearl Street. This was opened for patients on the date given above. It was abandoned in 1869, its present successor being the new building in West 15th Street. The society in 1821 opened the Bloomingdale Lunatic Asylum, now transferred to White Plains, N. Y., the name "Bloomingdale" being retained.

The sources of income include, as main items, the payments of patients for board and treatment, $259,057.37 for 1893, and rents and ground rents, $166,150.36 for the same year. For special expenses bonds are issued and loans made. In the statement of receipts, "Donations, subscriptions, interest, etc.," amount to but $1,797.95 for the year, so that the refreshing spectacle of a great charity run on strictly business principles is presented in perfection by the society's administration. The salary item for medical attendance, owing to the self-sacrificing spirit of the physicians, is nothing. Were the time devoted to the work by the most eminent physicians and surgeons of the country computed and accounted for, the aggregate amount would be enormous. The free bestowal of services by men who receive the highest fees in private practice is a true charity of the most enlightened type. Among the professional men who are thus connected with the work may be mentioned Drs. Thomas M. Markoe, L. Duncan Bulkley, Robert F. Weir, William T. Bull, William H. Draper, James W. McLane, and Lewis A. Stimson. Mr. George P. Ludlam is the superintendent of the hospital work.

Irrigation by Electricity.

It is a well-known fact that in nearly all the arid land regions artesian wells can be obtained at a depth of from 300 to 600 feet, the water in these wells rising to within fifty feet of the surface. In some localities they flow. There are many places where abundance of surface water can be had by digging only a few feet. Especially is this the case near streams. To utilize water power costs much less than steam.

A power plant is imperative. The full capacity of a 10 horse power electric motor will yield power equal to a 10 horse power engine, and, if its capacity be not overworked, will last indefinitely. The same may be said of dynamos without regard to size.

The cost of a 15 horse power motor is $500. Foundations, power house, two 500 horse power dynamos with engines directly connected, and everything ready for operating, could be constructed for about $36,000. The power house, when run by steam, should be placed at a railroad switch. To construct for water power might cost as much, but the operating expenses would be much less.

A 600 foot well can be sunk for $1.500. It takes 27,154 gallons of water to cover an acre one inch deep. A 15 horse power motor will pump 750 gallons per minute, and raise the water fifty feet. Seven hundred and fifty gallons will cover forty acres one inch deep every twenty-four hours, or 280 acres every week. One well will furnish water during the irrigation season, from May 1 to August 31, to cover 280 acres seventeen inches deep. This is an abundance for almost any crop, and a great deal more than most crops require. The water could be pumped into a ditch or reservoir. The well could be sunk where most convenient, as the power comes to it by wire.

One thousand horse power will run fifty-six 15 horse power motors, and will allow 15 per cent loss for transmission of power from dynamos to motor. The lines for transmission, including poles, wires, etc., would cost from $8,000 to $10,000. Thus we see that 1,000 horse power would furnish an abundance of water for fifty-six times 280 acres, or 15,680 acres, about 24½ sections, at a cost, not including ditches and reservoirs, of about $160 000—a very little over $10 per acre. A larger amount is often expended in clearing some Eastern lands of timber and stones.

It takes three pounds of coal per horse power per hour, or 72,000 pounds for twenty-four hours, at a cost of from $1 to $2 per ton, according to freight, or $72 per day for coal. The other power house expenses, including oil, can be run for $18. One man, with the use of a horse, can look after ten motors, making an expense of $10 per day, giving a total operating expense of $100 per day, or $12,300 for 123 days, the entire irrigating season, less than $1 per acre.

In valleys where the fall of streams is not sufficiently rapid to admit of taking out ditches, ditches can be built, the stream dammed, and the water raised to the required height by pumps through means of pipes, each pump working by motor. It makes little difference whether the water be raised perpendicularly or otherwise.—Irrigation Age.

Narragansett Bay Defenses.

The fortification of Narragansett Bay has long been regarded as a most important matter. The great number of army and navy equipments it contains makes it a very important station, and the measures taken to provide for its defense are therefore on very ambitious lines. It is reported that the torpedo defense of the bay, planned some months ago, is now nearly completed and ready for its equipment. The torpedo casement, which is the last stage of its development, is practically finished. On Dutch Island, another stronghold, the work is about complete, and the torpedo mines in both the main and west entrances to the harbor will soon be placed in position. These are to be connected by wires with the casement on shore, and may thus be set off singly or collectively, without doing any damage to the casement itself. Mortar batteries and modern guns are also being built to equip the casement. A request will be made of the next Congress for funds to construct a mortar battery for Narragansett Bay similar to the one in Boston Harbor. The foundations for such a battery may be commenced in the near future. The mortars will be of the new breech-loading pattern. The defensive measures will be completed as early as possible. The mines will of course not be put in position until it is a possibility that there will be actual use for them.

To Obtain Pure Serum.

A philanthropic citizen has recently placed $30,000 at the disposal of the Health Department of New York City for the purpose of providing an adequate supply of pure anti-toxine serum. In view of the large death rate from diphtheria in New York at the present day this provision is of the greatest importance. The necessary animals and laboratory equipments will be secured immediately, and it is expected that the first supply of serum will be ready by the first of the year. The serum is at present very costly, but it is hoped that in time it may be put upon the market to be sold as cheaply as vaccine virus.

In a report made recently to the Board of Health by Dr. Cyrus Edson, it was stated that several spurious concoctions of anti-toxine serum have been placed on the American market. And it was urged that the grave consequences following such fraud necessitated the prompt and vigorous action of the health department. Acting upon this advice it was resolved that measures should be taken to supervise the sale of this valuable remedial agent by a scientific and thoroughly systematic inspection of all preparations. The detection of such fraud will lead to the trial and severe punishment of the offenders. The preparations occasionally furnished from Germany have specific guarantees as to their strength and purity by reliable scientists. It is to be hoped that some similar provision may be made to guarantee the use of pure serum in America.

The Omnivorous Shark.

Secretary L. H. Shearman, of the New York and Pacific Steamship Company, has received a letter from M. P. Grace & Co., of London, describing a curious incident. At Terre de Cap Dessaintes, Guadaloupe, in the West Indies, a shark was killed recently, and when it was cut open there were found in its stomach a package of inventories, invoices, and other documents originally placed in the hands of the purser of the steamship Capac, of the New York and Pacific line, which sailed southward from this port on her maiden voyage on Nov. 10, 1893.

The papers which were lost on the voyage and found in the shark's belly were duplicates and of no particular value; hence little attention was paid to their disappearance.

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Trial of the Langley Aeroplane.

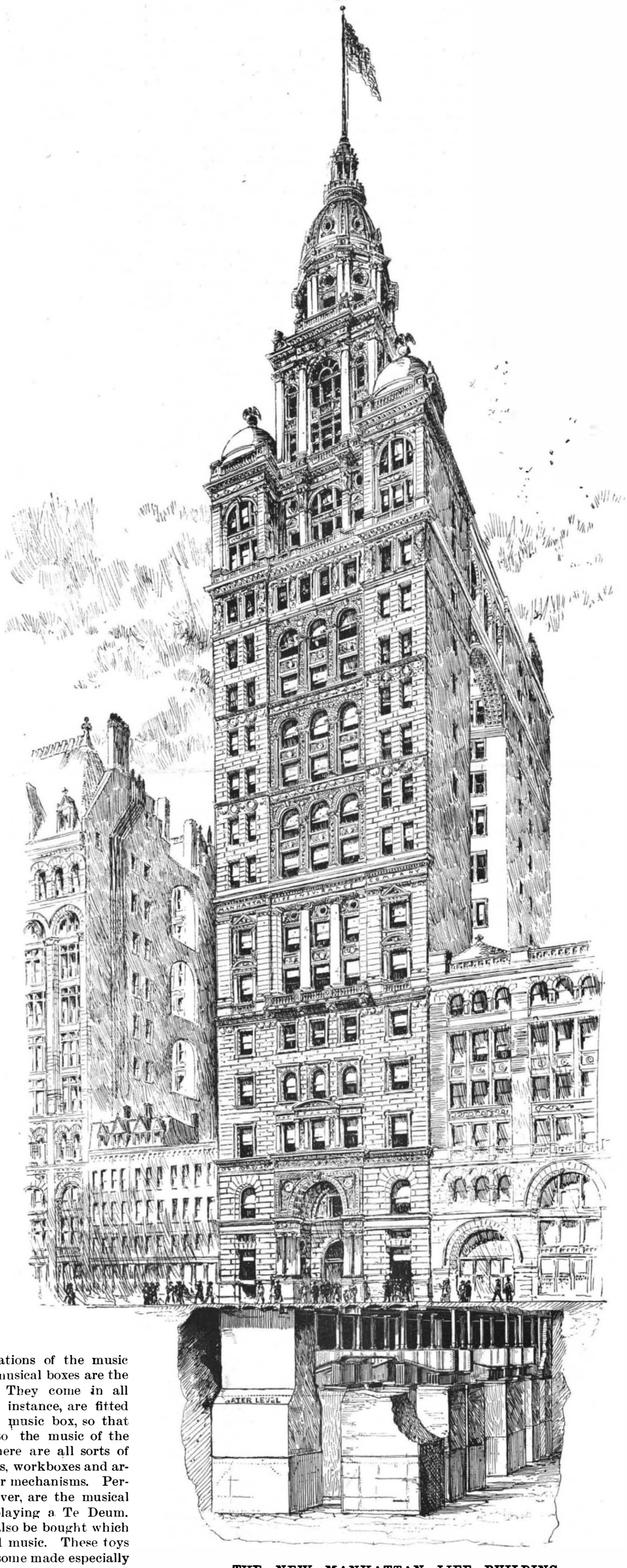
On the afternoon of December 8, in a landlocked bay at Quantico, Md., with only fishermen for spectators, a trial was made of Prof. Langley's new aeroplane. For some time past preparations have been made for this trial in a workshop at the rear of the Smithsonian Institution, of which Mr. Langley is the honored secretary. Quantico is a village on the west side of the Potomac, about thirty miles from Washington. A small workshop has been installed on a scow which is anchored in the narrow channel between the mainland and an island. To the roof of this workshop the new machine is suspended. Quantico is admirably suited for experiments, as it is not likely to be frequented by inquisitive visitors. The shape of the new air ship is somewhat like that of a porpoise. The wings incline upward and the machine is suspended much as a kite is held in mid-air, only in place of the wind and strings are a pair of rapidly revolving screws. After experiments on different forms of motive power, Mr. Langley has decided that a light steam engine is preferable to the heavy storage battery.

The trial was conducted in a rain. The machinery was started and when the proper degree of tension was reached, it was released. The great aluminum bird, measuring ten feet from tip to tip of the wings, rose slowly in the face of the wind and sailed away for some distance. It then alighted upon the surface of the water, where it floated. It was picked up by a rowboat and brought to the scow.

Although the experiment was successful, much remains to be done to perfect the air ship, and to make it more dirigible. The aeroplane is subject to strange eccentricities of motion, and these must be guarded against before a long flight can be attempted. The world is watching with interest the experiments now being conducted by two American inventors, one in America, the other in England, Langley and Maxim. For four hundred years the minds of men have been occupied by the problems of aerial flight, and there now seems a good prospect of their practical solution before the close of the present century, especially when the experiments are conducted by men of such high standing. The time has arrived when the perennial jokes regarding "flying machine cranks" have lost their point.

Novel Music Boxes.

Among the Christmas novelties of the present season a number of very curious adaptations of the music box are to be found. The Swiss musical boxes are the most elaborate and ingenious. They come in all shapes and sizes. Beer mugs, for instance, are fitted with a false bottom containing a music box, so that a German may drink his beer to the music of the "Watch on the Rhine," and there are all sorts of musical flower pots, cigar temples, workboxes and artificial birds supplied with similar mechanisms. Perhaps the most curious form, however, are the musical statues and the model crucifix playing a Te Deum. Many forms of sacred relics may also be bought which play well known pieces of sacred music. These toys vary in price from $2 to $250, and some made especially to order bring much higher prices.



THE NEW MANHATTAN LIFE BUILDING

THE MANHATTAN LIFE BUILDING.

We publish in this issue illustrations of the Manhattan Life Insurance Co., another of the buildings of extraordinary height which are gradually transforming the appearance of this city. In its construction it represents the most advanced type of steel frame construction, and in putting down its foundations the pneumatic system with steel caissons was applied for the first time to the foundations of an office building.

It rises 347 feet above the sidewalk, and its foundations go down 53 feet below the same level, which brings them 20 feet below tide water level, making a total of 400 feet. This building is probably the highest office building in the world, and some idea of its enormous altitude may be obtained by comparing it with some of the well-known types of high building construction. The Masonic Temple, in Chicago, is 302 feet high above the curb; Trinity Church spire, in New York, for a long time the highest pinnacle in the city, is only 284 feet high; the statue of Liberty, in the harbor of New York, rises 301¼ feet from the water level; the dome of the Capitol at Washington is 288 feet high. It is only by such comparisons that the height of this building can be realized.

The architects were Messrs. Kimball & Thompson, of this city. The front, of granite, is of beautiful design, which is well brought out in our cut. The rear, on New Street, is of buff brick, and the exposed side walls, of red brick, have been painted to correspond. Our thanks are due to the firm for many courtesies extended.

The foundations, which consist of fifteen masonry piers, are carried by the same number of steel caissons. The latter were sunk to bedrock by the pneumatic process. One of our cuts illustrates an interesting phase of the work, in which an air blast, caused by the outrush of air through a pipe connected with the interior of the caisson, acted as an elevator and forced out the material excavated by the shovels of the workmen. The loose material was shoveled into a receiving chamber or funnel, and the ordinary air pressure in the lock carried it up to the surface of the ground, where it was free to be carried away in the usual way.

The caissons, after reaching the desired level and after the rock bed had been cleaned, were filled with a concrete, consisting of 1 part of Portland cement, 2 parts of sand, and 4 parts of broken stone. The brick piers, which were built upon the caisson as it descended, were laid in a mortar consisting of 1 part of cement and 2 parts of sand.

The front of the building, made of solid granite, is practically self-sustaining, while most of the rest of the building is carried by the steel frame, which includes 32 columns distributed over the 15 masonry piers. The calculation of strength is such that every square foot of the floors

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and of the roof could be loaded with a weight of 175 pounds and the building still be within its factor of safety. This factor is a very liberal one, being placed at one-third the ultimate strength.

In its foundation we find a very extensive use of the cantilever system. This feature is shown in the large cut, where the foundation trusses are seen carrying the columns. The side wall columns rest upon the outer ends of the cantilevers, whose fulcra are some seven feet back from the side walls of the building. The enormous weight of the building, which, when empty, excluding foundations, is placed at 60,000,000 pounds, necessitated the use of enormous cantilevers and trusses, among them being twelve 88 ton cantilevers and one 39 ton girder. The mere story of the transport of the great girder through the streets by a team of forty horses, the truck rolling over a specially laid track to prevent destruction of the pavement, is of interest. The great cantilevers were transported in 22 ton sections, which were put together on the ground. In the frame, 5,800 tons of iron and steel were used, including about three-quarters of a million of rivets and bolts.

In its erection very remarkable results in rapid construction were attained. In less than five months the foundations were completed, and three months sufficed for the steel frame to reach the roof level. The exact figures of its weight give an interesting relation between the weight of a building and that of its floor loads. If every floor were fully loaded, 5,000,000 pounds, or 8⅓ per cent of the original weight of the building, would be added to it. In other words, it represents one of those structures which if strong enough to carry itself can carry all the living load that can be placed within or upon it.

The columns were made in lengths covering three stories and averaged about fifteen tons in weight. The steam derricks used for raising the frame pieces were so powerful that when a truck load of the smaller parts reached the building, a chain sling was put around the entire truck load and the whole was hoisted at once. A gratifying feature of the work was that it was done without the loss of a single life.

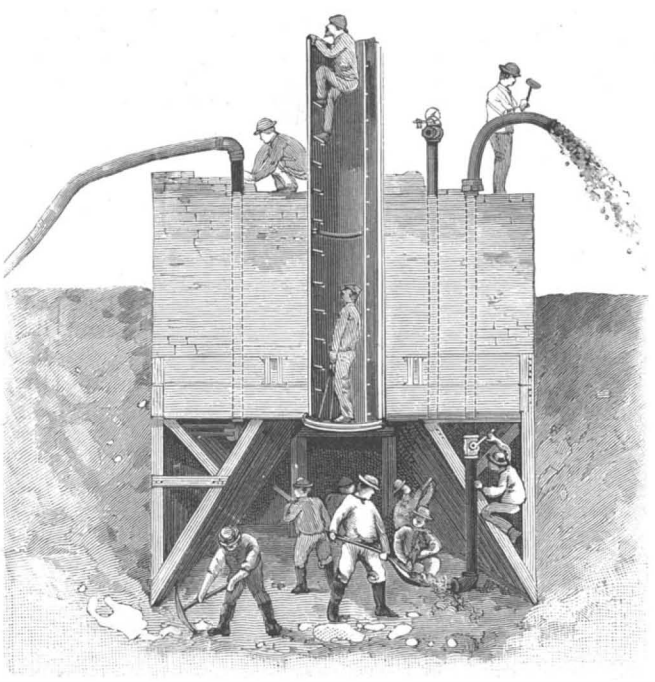
One of our cuts shows the wind bracing in the dome. The dome is made on a steel frame whose rafters are braced by short diagonal tension rods with a turn-buckle in the center of each rod, so that the whole can be set up as tight as desired.

The main steel frame stops a little short of the extreme top; above it the light copper and steel structure rises to the apparent foot of the flagstaff. This staff takes all its support from the steel frame, and is quite disconnected from the light work immediately surrounding it. A finial acting as a rain shield encircles the staff at its base, forming, apparently, a portion of the cupola.

As the great height of the building exposes a large surface above its neighbors, it is subjected to a considerable wind pressure, and this has been most carefully investigated. Within its factor of safety the dome is calculated to bear a wind pressure of 50 pounds per square foot and the rest of the building one of 30 pounds per square foot, the latter pressure being enough to blow a railroad car off the track. Here again the factor of safety is so large that it is utterly impossible for possible wind pressures to have any effect on it whatever.

The tower at its base rests upon the roof, which by concrete filling on corrugated steel flooring transmits wind strains through the entire structure and outer framework to the foundation. Double angle iron knee braces are used at the connection of columns and girders to insure stiffness. Even the turning moment of the building has been calculated, and it has been found that its stability considered as a rigid structure is seven times greater than the highest overturning stress which the wind could bring to bear upon it.

The interior work is of the finest description. The mosaic floors, embodying some very complicated work, deserve particular mention. There is an Indian chief's face just within the entrance which ranks as a work of art. The design work in mosaic is executed by pasting the pieces of colored marble face down upon a piece of paper on which the design is drawn.



EXPELLING EXCAVATED MATERIAL FROM A CAISSON BY THE AIR BLAST.

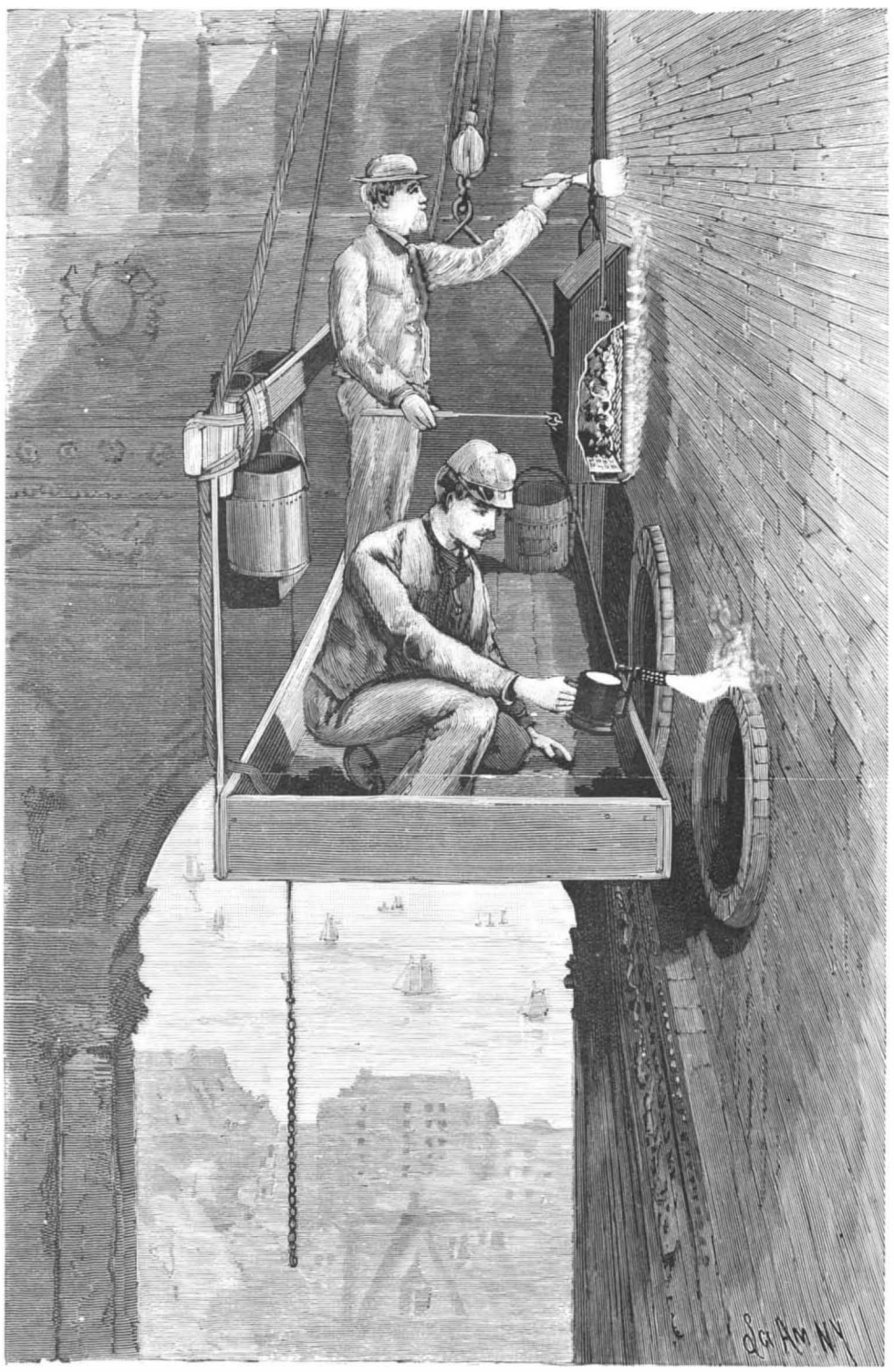
These are then set in the cement on the floor, paper side upward, and are finally polished, the paper being washed off. We have not space to even summarize the other items of the interior work.

One of the most interesting and important operations in the construction of the Manhattan Life building is the waterproofing of the brickwork, as executed by the Stone and Brick Waterproofing Company, 132 Nassau Street, New York. The readers of the SCIENTIFIC AMERICAN will recall our descriptions of the Caffall waterproofing process, which has been applied to the Central Park obelisk, and has there proved completely successful in preserving the stone from disintegration by the extremes of the American climate.

We illustrate in this issue the Caffall process as applied to the Manhattan Life building. The wall surface is first heated and then melted paraffine is applied before it cools. For the flat surfaces the workman is provided with a sheet iron stove, supplied with charcoal. This is held with its face against the wall, and as the charcoal burns it heats the portion in front of it to about the temperature of boiling water. The workman has at hand a pot of melted paraffine wax. This he applies by a brush to the heated bricks, constantly moving the furnace and working on the heated portion. The hot bricks absorb the melted paraffine rapidly and are thereby rendered impervious to moisture, and after the treatment no vegetable growth can appear upon them. The interior of the building will be far drier than it would be were the bricks used in their natural state.

In the Manhattan Life building some of the brick were buff colored and others were red. The latter had to be painted and the Caffall process was applied to red and buff alike, for it has been found to be an admirable preliminary for painting operations, as brick thus treated absorb paint far less greedily than do the natural brick, and as the paraffine excludes the possibility of alkaline matter from the cement exuding from the pores of the brick, the oils of the paint are prevented from saponification. The mechanical action of such salts is also prevented.

Paraffine is, of all chemical substances, one of the most difficult to decompose, except by very high heat. It is one of the most water repellent substances known, so that brick or stone, whose pores are filled with it, is in the best possible condition to resist moisture permanently. It has been found that years of exposure have no effect upon the preparation. While the stoveful of burning charcoal is very hot, the walls treated are but slightly heated thereby. A temperature of but 200 degrees is required for the process, and any such temperature will not affect the most fragile stone. Very exhaustive tests have been applied by scientists to determine whether any injury can be done to building stone by its application, and it has been found that no injury was done, and the idea that high heat in this process was applied to the stone has been found to be fictitious. In places about a building where the large, flat-face stove cannot reach, the blast lamp or blow-pipe is used, and in the cut one of the workmen is shown using this instrument. The cut also shows the construction of the stove with open front and suspended from a pulley with a counterpoise. A little shelf or ash pan is secured below the perforated bottom of the stove to catch any ashes. There is a handle by which the stove is moved about from place to place. The melted paraffine is applied to the portion of the bricks just heated. The first application of the paraffine darkens the color of some stones. For such cases a process is subsequently applied which restores perfectly the original color.



WATERPROOFING THE WALLS OF THE MANHATTAN LIFE BUILDING BY THE CAFFALL PROCESS.

A VALUABLE geological map of Alabama has been published by the Geological Survey of the State. The map is large, the details are clearly drawn, and the whole will be found very satisfactory. The various geological formations are indicated by different colors, and can be traced with great accuracy. The map is based upon recent surveys, and free use has been made of the Atlas of the United States Geological Survey. A valuable feature is the large chart accompanying the map. This gives much valuable information concerning the fossils of the State, the thickness, area, and distribution of the soils, the useful mineral products, the character of timber growth, and other similar information, together with the names of the reports in which a more detailed account of these features may be found.

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The Sorghum Industry.

The season for manufacturing sorghum sirup and sugar is over, and although exact results of the campaign cannot be stated until the products have been entirely disposed of, yet it is possible now to consider the present state of the sorghum industry.

Sorghum manufacture consists in making sirup and also sugar. It is a common error to measure the sorghum industry simply by its yield of sugar. The value of the sorghum sirup product of the country is greater than the value of the sorghum sugar. In small factories sirup only is produced, and in large factories sirup, sugar and molasses are produced. The sorghum crop is of sufficient importance in twenty-four States to be reported monthly by the government statistician, along with sugar cane, rice, wheat, corn, and other leading crops of the country.

The season for sorg um manufacture usually begins in August. At that season sugar cane sirup is not found in market. There is, then, a general demand for "new crop sirup." At the beginning of the season the sirup factories find a home market for their product, and the sugar factories use quantities of cane which is not fully ripe in the manufacture of sirup.

The beet sugar factories and the sorghum sugar factories have a considerable advantage in the fact that there is usually an active demand for sugar in the months of August and September for use in preserving fruits. As a rule sugar brings a higher price in those months than it brings in the months in which Louisiana sugar is marketed. And sorghum has an advantage over beet manufacture in the fact that it is possible to make a fine sorghum sirup during the months when the market is bare of sirup, or whenever sirup pays better than sugar. Sugar refiners utilize a part of the residues of sugar refining by converting them into sirup, and it is said that there is sometimes more profit in the sirup made from the residues than in the refined sugar, for the reason that sirup sometimes brings a relatively higher price than sugar. It seems probable that, for a time, the production of fine uncrystallizable sirup will form a considerable part of the output of sorghum sugar factories, and that only the best cane, which alone is profitable for sugar manufacture, will be worked for sugar, and that unripe canes at the beginning of the season, inferior cane during the season, and frosted cane at the end of the season, will be worked for fine sirup, as the inferior residues of sugar refining are worked for fine sirup. So far the sorghum sugar factories have worked mainly for raw sugar, and incidentally for crude sirup. The result has been a small yield of sugar per ton of cane worked for sugar, a large yield of molasses which includes a considerable amount of sugar which cannot be extracted profitably, and inferior sirup which requires the manipulations of the "mixers" to fit it for use. It is not difficult to make a fine, uncrystallizable sirup from sorghum, which is superior for many purposes, if not for all, to the common mixed sirups. Considering the immense sale of mixed sirups, there seems to be room for a sirup which can be produced at a low cost and which is superior to the mixed sirups. There seems to be little profit in producing an inferior quality of sirup which is wanted only by mixers, as there is little profit in producing articles of low grade in any line. The sorghum sugar factories have produced a larger quantity of sirup this season than usual, and until the processes of sorghum sugar manufacture are improved so as to produce more sugar and less molasses, it seems better that only high test canes should be worked for sugar and that inferior canes should be worked for sirup. At present it is much easier to improve the manufacture of sirup than it is to immediately improve the extraction of sugar from molasses. The latter is a problem which long troubled sugar cane and beet sugar manufacturers, and it requires time for the sorghum industry to work out that problem, as it required time in the sugar cane and the sugar beet industries. While an increase in sugar yield is and should be the main object of the sorghum sugar factories, yet while accomplishing that object it seems necessary to utilize the cane in the best possible way with regard to immediate financial results.

The working of the sorghum sugar factories this season presented a striking contrast with the working of the earlier sorghum factories. The business management was better, the machinery worked smoothly, the processes of manufacture were performed more efficiently, expenses were less. The season's work showed the value of experience and of trained help, both of which were sadly needed in the earlier days of sorghum sugar manufacture.

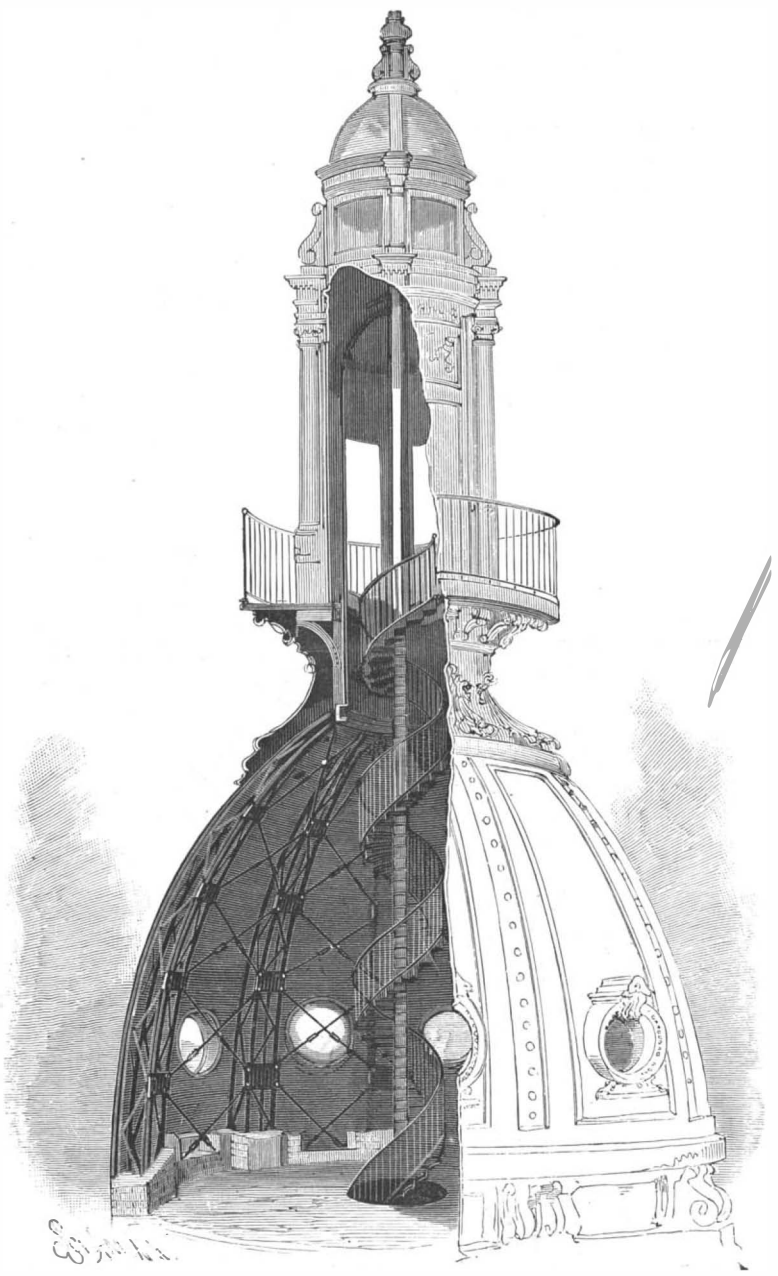
The general depression of business, the removal of the bounty on sugar, and the low prices of sugar affect the sorghum industry, as they also affect the sugar cane and beet manufacture, but never before in the history of the sorghum industry have so many plans been evolved at this early time in the season for improving and enlarging future work in sorghum manufacture. Those who are most concerned in the industry, and who know its needs best, confidently believe that if the sorghum industry can have the protection it should have for a limited time, to enable it to develop improvements already in sight, it can develop a magnificent industry without continued bounty or duty on sugar.—Louisiana Planter.

[LE JOURNAL DES DEBATS; PUBLIC OPINION.]

The Brain.

The nervous system is inclosed in a bony case composed of the bones of the head and the vertebræ; the encephalos is contained in the cranial cavity, the spinal marrow in the spinal canal. The marrow and the brain do not completely fill these cavities, and the interstices are filled with a liquid, which prevents shocks and compressions. From the marrow and the brain the sensitive and motor nerves start, which carry sensations to the two central organs and take back the movements. A sensation brought to the brain by a sensitive nerve generally provokes a motion, a contraction. In such cases the brain is a center, in which the impression is transformed into action. But very often the impression is not followed by any action; the nervous system then becomes a central storehouse for impressions. M. Brissaud very aptly compares the brain to a photographic plate which retains the image and only yields it under the influence of a developing body. The brain, particularly in infancy, stores up numerous sensations, which later cause actions. The cerebral center retains these images, that is, these lasting remembrances of outward excitements. The gray substance which forms the outside covering of the brain is a sensitive plate on which images of the outer world are impressed. The nerves conduct the electric, heat, light, and sound waves to this cerebral covering, where they are impressed as on the cylinder of a phonograph. The impression is more or less exact, according to the nature of the cerebral instrument; it is more or less profound, according to the breadth or the number of vibrations of the waves. The impression thus formed becomes a recollection; it tends to become effaced with age; it submits to alterations, according to modifications of the impressed surface. These images may remain unused in the brain for a long time, as the photographic plates in their box. The idea of an object is thus always the recollection of an object.

The association of ideas often causes an association of movements, called automatic. A little girl, for instance, learns to knit. At first she is very awkward, but gradually she progresses and the work almost does itself, until finally she walks, talks, and learns her lessons while knitting. The different automatic centers occupy localized regions in the brain. The most celebrated is the center of language, localized about 1825 by Bouillaud in the front lobe of the brain. When any injury whatever—rupture of a blood vessel, softening of the brain tissue, etc.—attacks this lobe, the faculty of language disappears and the patient is stricken with aphasia. There are several aspects of this disease. Sometimes the patient cannot speak, but is able to express his thought in writing: this is aphasia of articulation; others are able to speak, but cannot even write their own names: this is graphic aphasia; others, though not at all deaf, have no idea that the name they hear pronounced is their own name, although they may be able to speak it, read it, or write it: this is auditive aphasia; others, finally, without being blind, have lost the faculty of reading, although they can still write: this is visual aphasia. Right-handed aphasics, unable to speak, have suffered some injury of the third left frontal circumvolution, and left-handed ones of the corresponding right one. Those who cannot write have some injury to the second frontal circumvolution. Those who have lost the faculty of hearing have a wound in the first left frontal circumvolution, and those who cannot see writing one of the second parietál left circumvolution. Charcot has said, and M. Brissaud repeats: "In studying cerebral affections the nature of the injury is almost a matter of indifference; the localization is everything." One may become aphasic in consequence of an attack of apoplexy, a blow or shock which causes an abscess of the brain, or a cancer which presses on that organ. It can even be produced by tuberculosis. Alas! that the brain should be so delicate an organ.



MANHATTAN LIFE BUILDING—CONSTRUCTION OF THE DOME AND CUPOLA.

Sprained Ankles.

From time to time one hears of different means of caring for sprained ankles, turned ankles, twisted wrists, etc., but the way now in vogue, says the Eclectic Medical Journal, seems to give better results than any in the past.

It is generally within an hour after the accident that you are called in to see the case. The patient is suffering very severely, and wanting very much to know if "anything is broken." After examining for fracture, order the part to be bathed in extremely hot water, every hour or two, for a period of fifteen minutes at a time. Have the water just as hot as the patient can bear it, and apply with a sponge or cloth, rather than allow the ankle to lie in the water. Then dry and let the part rest quietly, wrapped in flannels, when an application of hamamelis or veratrum and hamamelis may be made.

Before retiring apply a flannel bandage tightly around the swollen part, only being careful that the circulation is not cut off.

It is surprising how the hot applications relieve the pain and produce absorption, and how the bandage, by pressure, prevents swelling and inflammation.

Derelicts at Sea.

The Admiralty and Board of Trade Committee, of England, have recently published a curious report on the subject of the destruction of derelict vessels. The committee recommend the better reporting of derelict vessels, as to their character and location and the publication periodically of such report. But, on the other hand, they do not deem it necessary to destroy abandoned vessels or to hold international conferences to discuss the subject. The report further states that the danger of collision with derelicts is probably much exaggerated, and that to publish the information concerning derelicts given in the charts issued by the United States would be likely to mislead and needlessly alarm English mariners. This casts a very unjust reflection upon the value of the United States charts. If the derelicts are a menace to navigation, as the committee's report virtually admits, they certainly deserve more serious attention.

THE National Car and Locomotive Builder has reached its 25th year of publication. It is one of the most interesting, practical, and useful journals in the world.

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Value of Photography in Scientific Research.

An interesting account of the services of the camera in scientific research has been prepared recently by a member of the Royal Photographic Society of Great Britain. It is generally admitted that the camera in recording scientific observations often serves to verify results with a thoroughness which no other test can. The English writer goes so far as to say that photography, in association with the telescope and spectroscope, has placed modern astronomy on an entirely new basis. The meteorologist by the aid of the camera has been able to study the form and nature of clouds, and the shape and character of the lightning flash. It has enabled zoologists to trace the real character of animal motion, and it is the only accurate means of reproducing the forms of organisms too small for the eye to see. The physicist has, therefore, been able to investigate phenomena in which changes occur too rapidly for the eye to detect. It is further claimed that whenever the observer of natural phenomena finds it necessary to make an accurate record of his observations, the camera is indispensable. Photography is also extensively employed in anthropology, geology, geography and archæology.

A New Hurricane Signal.

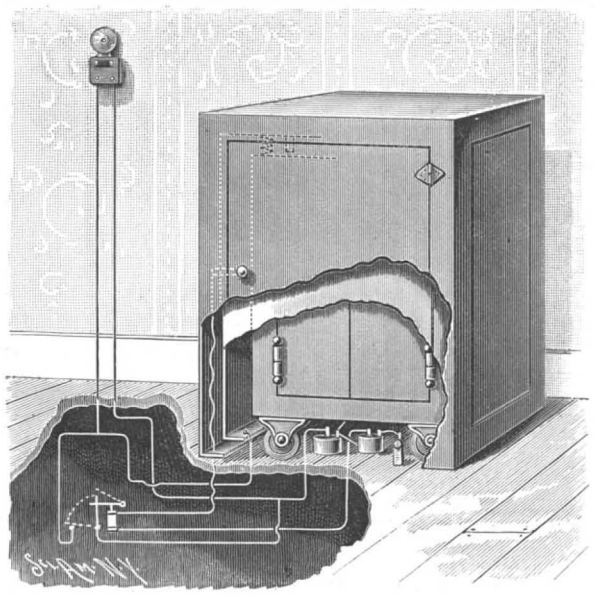
The Weather Bureau at Washington has caused the adoption of a new wind signal to be known as the "hurricane signal," to be used after January 1, 1895, as occasion demands. The signal consists of two red flags with black centers displayed one above the other. It will be used to announce the expected approach of tropical hurricanes and the dangerous storms which move not infrequently across the lakes and the North Atlantic coast. These flags will be of the same size and pattern as the one now used for the storm signal, except that the pennants will be omitted. There will be no distinctive night hurricane signal provided, but if the new signal be displayed during the day and is not changed before dark, the usual night storm signal will be displayed in its place. The direction of the storm signal will of course depend as usual upon the message accompanying the order to use it.

A CHINESE MODE OF PUNISHMENT.

In China they employ many modes of imprisonment and of punishment, the variety and magnitude of crimes being remarkable. Of these latter, perhaps, the most vulgar and common is infanticide. In Canton alone, it is said by those who are in position to know, thousands of infants are destroyed annually by their mothers. Our engraving, which is from a photograph, shows the form of punishment of three women for committal of this crime. They are yoked together between two boards made with openings just large enough to admit the neck. This apparatus is called the canja, and is the cause of unspeakable torment to the poor wretches who are doomed to its embrace.

AN ELECTRIC BURGLAR ALARM FOR SAFES.

According to the improved provision for the protection of a safe, represented in the accompanying illustration, the safe is inclosed by a metallic envelope or casing, which does not touch the safe and is insulated from it, the envelope having a door opposite the safe door. For this invention a patent has been issued to Messrs. James W. Gilstrap, of Spurgeon, Mo., and William D. Gilstrap, of Racine, Mo. The envelope or



THE GILSTRAP BURGLAR ALARM FOR SAFES.

casing rests on springs mounted on insulating blocks on the top of the safe, and depending from the envelope are top contact blocks, which strike the safe and close an electric circuit through an alarm when the springs are compressed. There is also an outer envelope which does not touch the inner one, but is in electrical circuit with the safe, this envelope resting on the floor, and also having a door opposite the safe door. A spring near this door acts as a circuit breaker when the door is opened, and in case either envelope is raised, it strikes either the safe or the other envelope, closing the circuit and sounding an alarm, a battery beneath the safe or other convenient place being connected by one pole with the safe and the outer envelope while its other pole connects with the bell. A closed circuit battery is also connected with contact lugs in the floor, which connect with the outer envelope, a wire leading from the other pole of the battery to a circuit closer composed of an electro-magnet and a hinged armature, normally resting on the magnet, but raised by a spring when the circuit is broken. When the circuit through this battery is broken, the drop falls, as indicated in dotted lines, and strikes upon the free ends of wires forming branches of the open circuit wires, thus closing a circuit through the bell and sounding an alarm.

The Arboretum.

Loudon, I believe, coined the word arboretum, about 1833 or 1834, but classified collections of trees and shrubs had been formed after the systems of Jussieu and De Candolle ten years or more before that date. Probably the collection of the Royal Horticultural Society, at Chiswick, near London, attracted the greatest attention because of the accessions of rare and new species.

No arboretum that I have visited, or seen described, has been eminent for beauty of grouping, or for giving more than a fragmentary idea of the vegetable kingdom.

The systems of botany have been partly responsible for this, but the imitative faculty of the designers even more so, and the result has been in many cases a really tiresome lineal repetition of closely allied forms.

To-day, however, the aboretum may be made beautiful, for not only has the botanical classification been very greatly improved, but we are advanced so far along the speculative and experimental stages that the best and most suitable typical forms may be selected for the harmonious grouping of the varied cohorts of vegetable life adapted to a given climate.

It has been stated recently in the Tribune that "5,000 kinds of trees" would be included in the arboretum forming in North Carolina. This is undoubtedly an error, but if it were possible, it would be very unadvisable to multiply mere varieties to that extent.

The whole flora of New Jersey contains less than 2,000 species (exclusive of mosses, fungi, etc.), and it cannot be anticipated that any hardy collection of plants in a given spot in this country will exceed about 4,000 species and distinct varieties. These, if purchased in single plants, would average less than fifty cents each.

School gardens giving a good illustration of all the hardy orders could get along with about 1,500 plants, and for purposes of comprehension, such collections would be better than the larger ones, which are impossible to be retained in the mind.

Trenton, N. J. JAMES MACPHERSON.

Eating Ice.

The following thermodynamical problem is stated and solved by the Engineer: "A boy eats two ounces of ice. Let us see what is the approximately thermodynamic equivalent of the work he has made his interior do, assuming he takes five minutes to eat it. In melting the ice he will require eighteen units to reduce it to water. To raise it in temperature to that of his inside he will require seven more units, or a total of twenty-five British thermal units. Taking the mechanical equivalent as 777 foot pounds, this will be equal to 19,425 foot pounds. If the boy weighs 100 pounds, he will have called upon his stomach to do as much heat work as would, with a machine having unit efficiency, raise him 194 feet high, or a rate of heat extraction equal to nearly an eighth of a horse power."

A CHINESE MODE OF PUNISHMENT.

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RECENTLY PATENTED INVENTIONS.

Engineering.

THROTTLE AND SLIDE VALVE.—John P. Devoissaud, Sherman, Texas. This inventor has devised a novel throttle valve in plate form, sliding between the main valve seat of a steam engine and a cylinder head closing the front ends of twin cylinders. It is actuated by a governor device operated by the main shaft, thus controlling the steam supply. Operating in combination with this valve is a peculiarly constructed main slide valve, affording a complete and superior valve mechanism for a quick speed steam engine.

FEED WATER HEATER AND CIRCULATOR.—Edward Jones, New York City. According to this improvement a feed pipe extends through the fire box, in the bottom portion of which are circulating pipes in communication with the water legs, while side tubes extend upward from the circulating tubes and connect with upper tubes and the feed pipe. The improvement is adapted for a stationary or locomotive engine, the amount of water forced into the boiler is thoroughly under control, and when the pressure in the tubes becomes too great it may be conveniently relieved, while if the water in the boiler reaches too high a level, the supply is automatically reduced. In case of leakage in the fire box tubes, they may be closed from the exterior and the tanks readily reached for repair.

Electrical.

BATTERY CONNECTION.—Walter S. Doe, Brooklyn, N. Y. This invention relates to lead plate storage batteries, providing therefor a positive contact and separation of the plates, while the acid vapors are prevented from affecting the contacting surfaces. The improvement consists of a contacting disk surrounded by an elastic ring for hermetically sealing the joint between the face of the disk and the lead plate, so that the joint is covered and hermetically sealed by the elastic ring or compressed composition, whatever contacting surface may be employed.

BILGE WATER ALARM.—Colcord Upton, Salem, Mass. This inventor has devised a float-operated circuit closer for marine vessels, to give an alarm when the water rises above a certain limit, insuring a more efficient contact on the rise of the water than has heretofore been effected. The case has terminals for the line wires, and vertically through the case extends a guide rod on which is a float, there being on the float a vertical spiral spring supporting yieldingly a contact plate.

BURGLAR ALARM.—John H. Lowe, Neosho, Mo. This alarm is particularly adapted for use in connection with a safe, which is inclosed in a movable case provided with electrical contacts, the electric circuit including an alarm and a connection with an electrically operated mechanism for opening a fluid-containing case, whereby the room in which the safe is located will be filled with noxious vapors, in which a person cannot live

Mining, Etc.

FILTER BARREL.—Norris H. Cone, Leadville, Col. This is a machine for use in mining operations, for treating any pulp composed of liquids and solids. It is composed of a revoluble cylinder in which are a series of independent removable sections, each comprising a filter bed, a grating on the cloth, with devices attached to the cylinder between adjacent filter sections to hold the latter in place on the inner surface of the cylinder. The heads of the cylinder have channeled heads and ports which open into recessed trunnions. The interior parts of the machine are plated with silver and lead, or other suitable plating, for protection against chlorine and sulphuric acid.

Railway Appliances.

CAR COUPLING.—Ludwig Grunwald, Norwalk, Ohio. The drawhead of this coupling is vertically slotted near the front end, a draught lug on top being curved rearwardly in front of the slot, in which is adapted to rock a curved drawbar having its upper end forked to embrace the draught lug, while a draught link is pivoted on these forked limbs and means are provided to rock the drawbar from the front of the drawhead. The device is of simple construction and the coupling is automatically made, the uncoupling being readily effected from the side of the car.

SWITCH.—Charles H. Eimke, Brooklyn, N. Y. This improvement is more especially adapted for use on street railways, especially those employing cable or electric cars. The mechanism is simple, and includes contact pins to be struck by a moving car to throw the switch point to either side, these pins being normally below the roadbed, but being automatically raised by the passage of a car over the rails. The car is provided with a mechanism adapted to strike the pins and throw the switch.

TRAIN TIME INDICATOR.—William M. Six, Westfield, Ind. This is a register for stations by which trains can be bulletined by the operator without leaving his seat. The register is contained in a suitable casing, from which operating cords lead to a keyboard in the operator's room, and in the casing, mounted on top and bottom spring rollers, are indicating bands or canvas, on which are marked "due time," etc., of trains, these bands being moved by the keyboard connection to bring the proper announcements in front of sight openings in the opaque glass door of the register case.

Mechanical.

SUPPORT FOR CUTTER HEADS.—Andrew Kendig, Texarkana, Texas. In tools for woodworking machinery, this invention provides a support for cutter heads of planers and other machines whereby the bits or cutters may be conveniently sharpened or dressed. A spindle supporting the head is mounted to turn and slide in a bearing, a transverse pin in the spindle being seated in grooves in the bearing, while a spring-pressed bolt connected with the rear end of the spindle holds it in an innermost position and with the pin in engagement with one of the grooves.

WRENCH.—James Fatkin, Aspen, Col. This is an improved pipe wrench, with but few parts, quickly assembled or separated, and any one part replaced when injured. In a slideway on the inner face of the shank of the fixed jaw is fitted a sliding and slotted block whose upper end comprises the movable jaw, pivoted by a pivot nut in the slot, while an adjusting screw loosely carried by the block has threaded connection with the pivot nut, the adjustment of one jaw to the other being thus effected with a rocking action of the movable jaw, one motion not interfering in the least with the other.

WATER POWER.—William E. Vernon, San Angelo, Texas. Adjoining a dam in a stream is a power house, according to this invention, in which are inlet openings of the height of the dam, and controlled by gates under the manipulation of the operator on the roof of the power house. In this house is a raceway leading downward to an undershot wheel adapted to operate pumps in separate boxes at the sides of the lower part of the power house. An apron in the bottom of the raceway guides the water upon the wheel.

Miscellaneous.

OXYGEN GENERATOR AND HOLDER.—George R. Prowse. Montreal, Canada. This is an improvement upon a formerly patented invention of the same inventor, providing an automatic device for moving the generating burner by a step-by-step movement, bringing the flame on one after another of the pockets of the retort, the movement being controlled by the descent of the top of the gasometer. A slide on a ratchet bar at one side of the gasometer casing carries a burner under the oxygen generating retort, a plate having a series of hooks attached to the top of the gasometer engaging a spring-pressed bolt carried by the slide, while an adjustable spring-actuated arm moves the burner forward as it is released.

COTTON PICKING MACHINE.—George C. Phillips, Manchac, La. Arranged in connection with a wheeled frame or truck, according to this invention, are toothed rotating rollers or cylinders, to travel on both sides of a row of cotton plants and extract the cotton from the bolls. These toothed rollers are mounted in a swinging frame in rear of the truck, and are enabled to move laterally as required, that the picking rollers may work in contact with the cotton plants, the cotton being removed from the teeth by a brush and deposited in a suitable receptacle.

OIL WELL PUMP.—Adam Rosenkranz, Allegheny, Pa. This improvement is designed to prevent grit or other impurities from passing between the plunger and the parts in which it works, thus reducing the wear to a minimum. The plunger reciprocates in a packing cylinder at one end of the pump barrel, there being outwardly projecting stuffing boxes at each end of the packing cylinder, while a spring is arranged in the cylinder between the packings to press them into contact with the plunger.

ROTARY BOLT.—Thomas Stevens, Vigo, Ohio. This bolt is mounted to revolve on a feed cylinder at one end and a tailings discharge cylinder at the other end, spiders revolving with the bolt and having their spokes connected by longitudinal bars, and an elevator bucket and pitch board being secured to each bar. Both heads are made solid and absolutely tight, doing away with "speck boxes" and securing the entire use of the cloth in bolting, the feed and discharge being central, and the bolt being designed to produce flour of a very high grade.

PURIFIER AND AERATOR.—James and Thomas F. Newby, Harrisburg, Pa. This is an improved apparatus for separating dust, fluff, etc., from middlings and break stock and for aerating flour and flour stock. It takes air from outside the building, strains it through a cloth, and, by means of a fan, passes it through purifying cells to the lower portion of a main case where the stock is delivered, and thrown off in a sort of spray through which the pure air passes, every particle of the stock being thus thoroughly dried, cooled, and freed from dust, causing it to bolt more freely in the mill, and making the flour pack better, keep better, and absorb more water in baking. The apparatus acts on a continuous stream of stock passed through it.

BREAKDOWN GUN.—Milan S. Barker, Eugene, Oregon. In breech-loading guns having the barrel hinged on the stock this inventor has devised a simple construction whereby the hammer is automatically cocked on opening the barrel for removing the shell. An accidental discharge of the gun is not liable to take place, for when the hammer is set the triggers and sears are automatically locked in place until it is desired to fire the gun, when a safety button is pressed forward, unlocking a bar over the sears.

DIVING APPARATUS.—John D. Cooper, Cheboygan, Mich. This inventor has devised a small house, to contain one or several operatives, and adapted to be sunk near a vessel's hull, or wherever desired. It may have boring or other tools, with suitable driving mechanism, readily operated, the tool being so carried that it may be changed without going to the surface, while it may be directed laterally or vertically. This diving car or house is adjustably supported in position, may be moved about, has means of communication with those above the surface, and means for illuminating the space outside the frame in which the work is to be performed.

RADIATOR TRUCK.—Thomas B. Mason, Trenton, N. J. For readily moving radiators to their places in finished houses without injuring the woodwork or walls, this inventor has devised a truck whose side legs are adapted to be connected with each other by a cross bar, detachable chains extending from one side leg to the other and engaging the top and the base of the radiator. The truck also has a side leg with slidable caster, and a gravity locking device for locking the extending caster in place.

SHUTTER MECHANISM FOR CAMERAS.—Theodor V. Jensen, Copenhagen, Denmark. With this improvement the operator may set and release the shutter without stepping in front of the camera. It comprises a spring-actuated drum mechanism operated by a clutch mechanism, the drum mechanism being locked when under tension, and a fluid-operated piston rotating the drum against the spring, the locking mechanism being released in the return movement, permitting the drum mechanism to be actuated by its spring.

ATTACHMENT FOR MUSICAL INSTRUMENTS.—Lincoln Utt, Lexington, Mo. This is an improvement for harps, zithers and similar instruments to permit a player to play in any desired key and execute any one of the chords to produce all tones and modulations called for by the music. The attachment comprises a frame with vertically sliding and spring-pressed bars, horizontally yielding bars, dampening blocks, etc., the operator pressing the respective bars, according to the music to be played, after the frame has been placed in position, the strings not to be played being rendered mute by the attachment.

LAMP.—Ferdinand Doelle and Henry von Glahn, New York City. This is an improvement in the flame extinguisher of burners for Argand lamps, there being in connection with the sliding extinguisher tube two opposite spring supports for the extinguisher, consisting of slidable rods having lateral projections or shoulders, with guide tubes fixed inside the burner, there being springs on the rods, spring catches and releasing levers whose free ends project on one side of the burner. The extinguisher can only be released by simultaneous pressure on both levers.

CEILING PLATE.—Joseph W. Chamberlain, Bangor, Me. This inventor has devised a wall or ceiling plate provided with a gripping device to firmly take hold of a pipe, the device expanding and contracting laterally and vertically with the pipe, so that it does not lose its grip with changing temperatures, and the plate does not move in the slightest degree from the position in which it is placed. The device consists of a tapering spring attached to the plate, the contracted end being free and the spring being adapted for clinging engagement with the pipe at its free end.

BRIDLE FOR PAINT BRUSHES.—Charles Boeckh, Jr., Toronto, Canada. This is an improvement upon a formerly patented invention of the same inventor providing for the attachment of the bridle to the brush without lacing, the fastening devices being also located at the upper portion of the bridle, which may be cut at the bottom without interfering with the fastening, thus enabling the brush to be advantageously used for the longest possible time. The bridle may also be so applied that the brush will wear to a feather or beveled edge evenly throughout its length.

LADDER ATTACHMENT.—Theodore Wilkins, New York City. This is a device to facilitate the raising of long and heavy ladders, the side members of a bail-shaped anchor being hinged to the inner faces of the side beams of the ladder near their lower ends. The anchor has teeth or prongs to engage the ground when swung downward, and when the anchor is swung upward it is engaged by a catch on the inside of the beams, locking it in place out of the way.

SLIDING DOOR.—Leander H. Weaver, Hudson, N. Y. This is a collapsible and extensible door which may be used as a substitute for the ordinary swinging or laterally sliding doors, being out of sight when opened, as it is then collapsed and lying in a suitable case above the door opening. The door and its case are so made that they may be put up without the use of nails, and the door is very easily opened and closed.

WAGON BED LIFTING APPARATUS.—Orlo H. Drinkwater, Cedar Point, Kansas. For lifting heavy wagon beds or hay racks from the wagon gear onto a frame, from which they may again be placed upon the wagon gear without manual labor, this inventor has devised a simple and inexpensive apparatus in which the lifting is performed by the team drawing the wagon. The improvement comprises front uprights and a rear support to which are pivoted swinging lift members, braces automatically swinging into position to hold the lifter arms to an elevated position when set to be engaged by the wagon body.

TRIPOD LEG.—Robert G. McDowell, Ishpeming, Mich. For rock drills and similar machines this is a device of simple construction, permitting a convenient adjustment of the point in the sleeve attached to the tubular leg. A longitudinal keyway extends in one side of the lower end of the sleeve and opens into its bore, the key having headed end to prevent disconnection from the sleeve, while the tubular leg has a reduced end fitted into the enlarged bore of the head of the sleeve. A pin connects this head with the reduced end of the tubular leg.

FISH TRAP.—William M. McKenzie, New York City. This trap is especially designed for the capture of minnows, eels, etc., and consists essentially of a netting in the form of a bag, in the mouth of which is a funnel, also made of netting, extending into the body of the trap. The netting and funnel are distended by straight or bent rods, the supports being so connected that they may be readily disconnected or folded upon one another, and the trap to be placed in a small casing. Netting wings or fences may be advantageously used in connection with the trap, or it may be employed without such adjuncts.

BOTTLE.—George F. Kinney, New York City. A device to prevent the fraudulent refilling of bottles has been devised by this inventor, one not interfering with the filling or emptying of the bottle, but positively indicating whether or not the bottle has been tampered with afterward. It consists of a vertical toothed rod to be placed in the bottle, a float sliding on the rod having recesses in its top and spring teeth in the recesses engaging the rod. The float cannot be removed without breaking the bottle, and as the liquor is removed the float goes down, but will not rise if the bottle is refilled, its presence below the level of the fluid giving notice of such refilling.

CONFECTIONERY MAKING.—Leo Hirschfeld, New York City. A machine for depositing confectionery in moulds, designed by this inventor, is so made that the mould is held stationary while a carriage with the confectionery is moved over the moulds until all are filled. A number of moulds may be placed one on the other, and the carriage adjusted vertically to deposit confectionery as accurately in the upper as in the lower moulds. The carriage has conveniently adjustable valves corresponding to the number of moulds, all of which may be opened or closed simultaneously, and the feed may be changed as desired.

WINDOW SCREEN.—John G. Schill, Jersey City, N. J. By means of this screen a window is rendered perfectly insect proof, the screen fitting snugly to the window casing and yet being readily raised and lowered. The invention consists principally of a spring-pressed auxiliary stile, a fabric being attached to this stile and to the screen stile. The device may also be used for an inside blind by making the frame solid.

MOSQUITO NET FRAME.—Charles P. Dieco, Owensborough, Ky. This invention provides a supporting frame for detachable connection to a bedstead, the several parts being adjustably connected for securing it to bedsteads of different sizes, and the frame being of a simple and inexpensive nature. The net supporting frame, or its side arms on either side, can be quickly and easily raised by a person lying in bed.

BUCKLE.—Alfred Steiner, New York City. In this buckle is a plate with a projecting fixed tongue, a clamping frame provided with a pivot being journaled in the tongue, the frame pressing and clamping with its front end the strap on the front end of the tongue. A locking device is held on the plate to lock the parts of the buckle in place and prevent the untying of the strap by unauthorized persons after the strap has been drawn tight.

CHILD'S CARRIAGE AND CRADLE.—Ora Orr, Westport, Cal. According to this improvement, curved springs are detachably connected with the running gear, the body being mounted on and having a swivel connection with the springs, that it may be turned at right angles when used as a cradle. The invention combines two complete articles in one, its adjustment being readily effected with the child asleep in the body part, or the child may be removed with the carriage body without being disturbed. No material additional expense is involved in the manufacture.

DESIGN FOR A BADGE.—William H. Walsh, New York City. The leading feature of this design consists of a Maltese cross surrounded by a circular band and containing at its middle the configuration of a heart.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE GREAT ICE AGE AND ITS RELATION TO THE ANTIQUITY OF MAN. By James Geikie. Third edition, largely rewritten. With maps and illustrations. London: Edward Stanford. 1894. Pp. xxviii, 850. Price $10.

This important monograph hardly lends itself to review within anything like the limits at our disposal. In the nearly nine hundred pages of the book, with its exhaustive index, numerous maps and illustrations as required, we have elucidated the glacial phenomena of the earth, their agency in shaping the face of the land, the markings by which they are recognized, and a study of the action of the glaciers as derived from what is left of them on the earth at the present day. In these days it is especially necessary for geologists to be familiar with glacial action, not only with what it can do, but with its limitations. It is to be noted that this is the third edition of the book, largely rewritten, which indicates a success in the past which will, doubtless, attend it in the future.

THE WATER SUPPLY OF TOWNS AND THE CONSTRUCTION OF WATER WORKS. By W. K. Burton. To which is appended a paper on the Effects of Earthquakes on Water Works. By John Milne. With numerous plates and other illustrations. London: Crosby Lockwood & Son. 1894. Pp. xvi, 304. Price $9.

This work is a contribution from an engineer whose functions have been exercised largely in Japan. With its numerous illustrations and its text, it presents a most admirable description of the engineering aspects, in a general sense, of the water supply problem. Japan is the country of earthquakes, and it will be noticed that the title of the work specifies a special paper on the effect of earthquakes on water works, which appears particularly well placed in the work under review. As frontispiece there is a beautiful reproduction of the Lake Vyrnwy reservoir; perhaps the most picturesque structure connected with any city water supply. Throughout the book plates and smaller cuts are employed to illustrate the text, and the view taken of this subject is one of perfectly adequate scope, it not being at all injured by local bias. Several allusions to the work on our own Croton system are contained in the work. It has an excellent index and lists of plates and illustrations.

ELECTRIC TRANSMISSION OF ENERGY AND ITS TRANSFORMATION, SUBDIVISION, AND DISTRIBUTION. A practical handbook. By Gisbert Kapp. With 166 illustrations. Fourth edition, thoroughly revised. New York: D. Van Nostrand Company. Pp. xi, 445. Price $3.50.

This fourth edition of Professor Kapp's work is very elegantly printed, and with its numerous illustrations, tables, and diagrams, as well as its very practical data, offers a very excellent treatment of the subject of the transmission of energy. It is especially to be noted that it is brought up to date, as it treats of alternating currents for long distance transmission. The majority of the book, perhaps, is devoted to direct current work, for it is not yet clear that direct current systems, for some time to come, will not remain the most important of electric installations.

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AN ELEMENTARY TREATISE ON THEORETICAL MECHANICS. By Alexander Ziwet. Part III: Kinetics. New York and London: Macmillan & Company. 1894. Pp. 224. Price $2.25.

We have before now reviewed Professor Ziwet's works, but the present one is so very mathematical that but little can be said of it further than that "about one-half is devoted to the kinetics of a particle, the remainder being given to the kinetics of a rigid body and a brief description of the fundamental principles of the kinetics of a system." This is the statement of its scope with which the preface starts out. Kinetics is a science of growing importance. It is hardly too much to say that one who has thoroughly mastered the subject is on the road to obtain a knowledge of all physical science. Works like the present, giving so much in so short a space, are particularly to be welcomed.

THE ARCHITECT'S DIRECTORY FOR 1894. Containing a list of the architects of the United States and Canada, classified by States and towns, with the architectural associations to which they belong indicated against each name. Together with a classified index of prominent dealers and manufacturers of building materials and appliances. Published annually. New York and Chicago: William T. Comstock. Pp. 119. Price $1.

THE PRACTICAL APPLICATION OF DYNAMO ELECTRIC MACHINERY. By Carl K. MacFadden and William D. Ray. Second edition (revised). Chicago: Date & Ruggles. 1894. Pp. 167. Price $1.

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SCIENTIFIC AMERICAN

BUILDING EDITION.

DECEMBER, 1894.—(No. 110.)

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9. A picturesque and well appointed residence at Belle Haven, Conn., recently erected for E. C. Converse, Esq. Four perspective elevations and floor plans. An excellent design. Mr. Bruce Price, architect, New York City.
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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Minerals sent for examination should be distinctly marked or labeled.

(6325) F. J. M. asks: What causes the noise in snapping a whip? A. The sudden straightening of the end of the lash or snapper. This involves a velocity of such degree as to start sound waves in the air.

(6326) W. B. H. says: Will you tell me how to etch the designs seen on knives, razors, saws and and various tools? The design looks as if it were printed on and then etched with acids? A. For etching brands and marks on polished steel surfaces, such as saws, knife blades, and tools, where there are many pieces to be done alike, procure a rubber stamp with the required design made so that the letters and figure that are to be bitten by the acid shall be depressed in the stamp. Have a plain border around the design, large enough to allow a little border of common putty to be laid around the edge of the stamped design to receive the acid. For ink, use resin, lard oil, turpentine and lampblack. To ¼ pound of resin put 1 teaspoonful lard oil; melt, and stir in a tablespoonful of lampblack; thoroughly mix and add enough turpentine to make it of the consistency of printer's ink when cold. Use this on the stamp in the same manner as when stamping with ink. When the plate is stamped, place a little border of common putty around and on the edge of the stamped ground. Then pour within the border enough acid mixture to cover the figure, and let it stand a few moments, according to the depth required, then pour the acid off. Rinse the surface with clean water; take off the putty border and clean off the ink with turpentine. Use care not to spill the acid over the polished part of the article. For the acid, 1 part nitric acid, 1 part hydrochloric acid, to 10 parts water by measure. If the effervescence seems too active, add more water.

(6327) C. C. says: Please give me through the Notes and Query column of the SCIENTIFIC AMERICAN the name and a description of the inclosed specimen. A. Answer by Professor C. V. Riley, Honorary Curator of the United States National Museum.—The Three-lined Leaf Bug.—The black, coffin-shaped insect with sundry dull reddish lines, accompanying the letter from Mr. Carl Carlson, Hanley Falls, Yellow Medicine Co., Minn., of which he desires name and information is Leptocoris trivittatus, Say. This is a true bug belonging to the sub-order Heteroptera and quite common in the West and Northwest, where it is reported, especially from Utah. An old correspondent, Mr. A. Siler, of Utah, sent it many years ago as doing injury to apples, presumably by puncturing the young fruit, and causing it to become gnarled and withered. But the species attacks many other plants and is found in all stages of development, especially on green ash and box elder. Professor E. A. Popenoe, in the Industrialist for March 19, 1881, records it as being abundant at Manhattan, Kansas, in greenhouses, and as pumping the sap from various succulent plants, such as geraniums, ageratums, lilies, cactuses, etc. It is in the habit of congregating together and may be destroyed with the ordinary kerosene emulsion.

(6328) F. B. asks: 1. I have a laminated core (laminations made of small soft iron wire and placed in iron pipe) 1¾ inch in diameter by 5 inches long. What size wire should I use and how many layers should I put on to get the best advantage, most magnetism, when using two Gonda cells? A. No rule can be given for your case. The larger the gauge of the wire, the more of it can be used. The Gonda cells will run down so rapidly that no useful calculation can be based upon them. Use No. 20 wire and try three layers closely wound. 2. Do the laws for winding solid cores apply to winding laminated cores? A. Yes. 3. Having given a a core and the current, would you apply the same rules to winding for a magnet as you would to winding for a spark? A. Yes. 4. In a three-pole magnet is the amount of magnetism in the middle pole equal to the sum of the amounts in the two opposite poles? I wound a core with two layers of wire in one direction and the other two layers immediately upon this, but in the opposite direction. I think the magnet was very weak. Did not the last two layers have a neutralizing effect upon the first two? A. Yes; there must be equality. In the winding you describe one winding evidently neutralized the other. 5. Do you know of any one in the United States who manufactures Bell telephone receivers and transmitters? A. Consult our advertising columns.

(6329) F. G. C. asks how to tell the points of the compass by the aid of a watch and the position of the sun. A. The 32 points of the compass to correspond with the 24 hours of the day require ¾ of an hour to each point; and as the sun is approximately east and west at 6 o'clock A. M. and P. M. and due south at 12 M., at 6:45 its azimuth will be E. by S., at 7:30 E.S.E., at 8:15 S.E. by E., at 9 S.E., at 9:45 S.E. by E., at 10:30 S.S.E., at 11:15 S. by E., at 12 N.S., and so on for the afternoon quadrant.

(6330) Y. M. C. A., Savannah, says: We have a building for a gymnasium, covered with tin, the inside is open up to the rafters, the sheathing being nailed on the rafters on the outside and then tinned. We want to use this hall for lectures, musicales, etc., but during a rain the noise is so great that it kills all else. What is the least expensive way of deadening the sound? A. Cheapness is a stumbling block in work of this kind. Lathing and plastering is the proper thing to do. Common paper boards or straw boards, cut and fitted between the rafters and nailed to the sheathing with large tacks, will materially modify the intensity of the sound of the rain. If this is not sufficient, a match board ceiling can be made on the under side of the rafters with a building paper lining, which will be cheaper than plastering and may be found very satisfactory.

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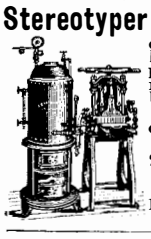
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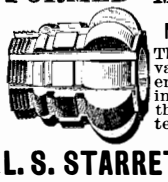
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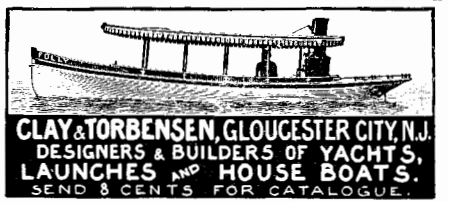

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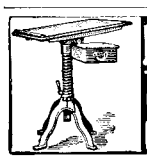

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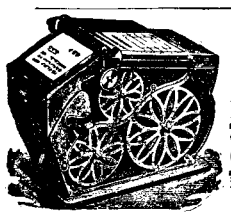

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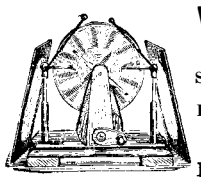

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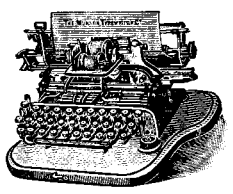

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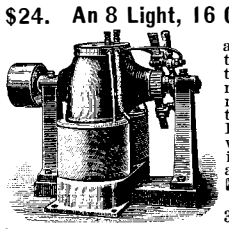

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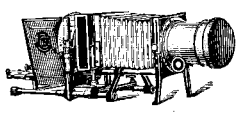

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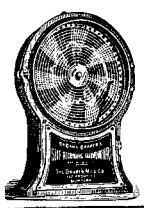

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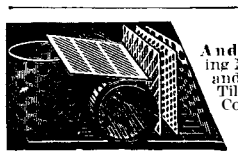

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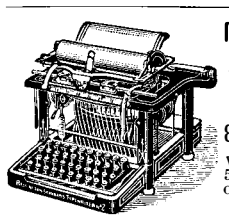

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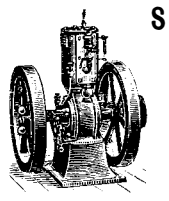

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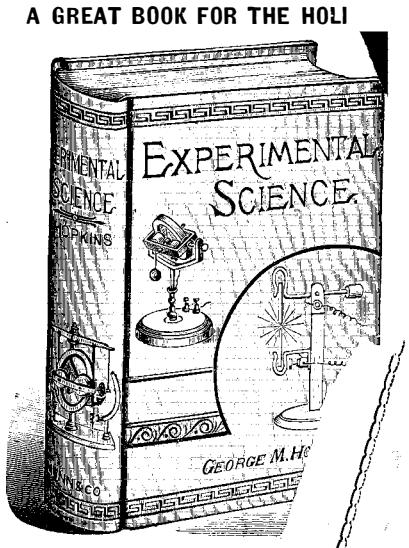

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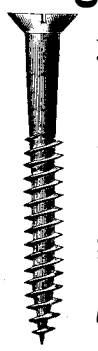

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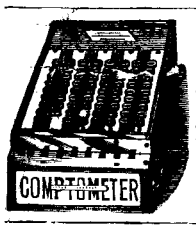

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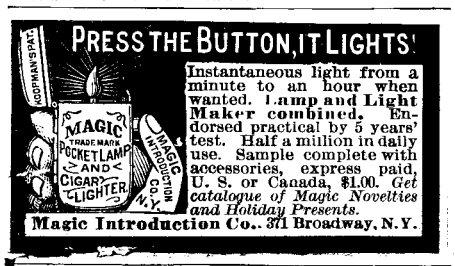

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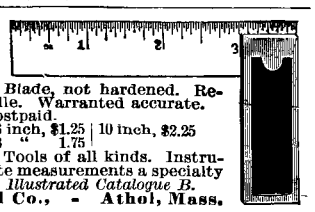

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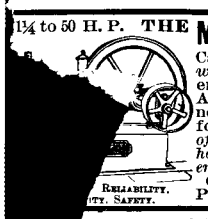

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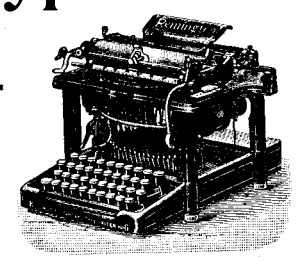

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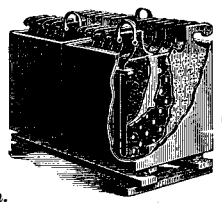

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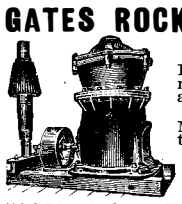

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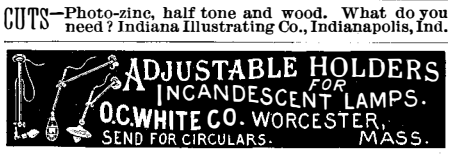

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